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VOL. VI.

INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.

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ENCYCLOPÆDIA BRITANNICA.

DIAMOND, a genus of earths of the ſiliceous kind, called *Adamas Gemma* by the Latins, *Demant* by the Germans and Swedes, and *Diamant* by the French, is the hardeſt of all ſtones hitherto diſcovered; commonly clear or tranſparent; though this property may perhaps belong only to the cryſtals, and not to the rock from which they originate. When brought to Europe in its rough ſtate, it is either in the form of roundiſh pebbles, with ſhining ſurfaces, or of octœdral cryſtals; but though they generally appear in octœdral forms, yet their cryſtals are frequently irregular, eſpecially when the ſurface inclines to cryſtallize during the ſhooting of the whole cryſtal, and alſo when ſeveral of them unite in one group; in which caſe the one hinders the other from aſſuming a regular form. Mr Magellan, however, informs us, that diamonds ſometimes aſſume other forms. He has ſeen a rough diamond in its native ſtate, of a regular cubical form, with its angles truncated or cut off; likewiſe another belonging to Dr Combe of London, whoſe ſquare ſides were naturally joined by two very narrow long facets, forming angles of about 120 degrees; and the corners were quite perfect.

Though the diamond is commonly clear and pellucid, yet ſome of them are met with of a roſe colour, or inclining to green, blue, or black, and ſome have black ſpecks. Tavernier ſaw one in the treaſury of the Mogul, with black ſpecks in it, weighing about 56 carats; and he informs us, that yellow and black diamonds are produced in the mines at Carnatica. Mr Dutens alſo relates, that he ſaw a black diamond at Vienna in the collection of the prince de Lichtenſtein. Some diamonds have a greeniſh cruſt; and of theſe M. Tavernier relates, that they burſt into pieces while working into a proper ſhape, or in the very act of poliſhing on the wheel. In confirmation of this, he mentions a large diamond worth upwards of 5000 l. Sterling, which burſt into nine pieces while poliſhing on the wheel at Venice.

The fineſt diamonds are thoſe of a complexion like that of a drop of pure water. It is likewiſe a valuable property if they are of a regular form and truly made; as alſo that they be free from ſtains, ſpots, ſpecks, flaws, and croſs veins. If diamonds are tinctured yellow, blue, green, or red, in a high degree, they are next in eſteem; but if they are tinctured with theſe colours only in a low degree, the value of them is greatly diminiſhed. There are alſo diamonds of other complexions; ſuch as brown, and thoſe of a dark hue: the firſt reſembling the browneſt ſugar-candy, and the latter duſky iron. In the *Philoſophical Commerce of Arts*, Dr Lewis tells us of a *black* diamond that he himſelf had ſeen. At a diſtance, it looked uniformly black; but on cloſer examination appeared in ſome parts tranſparent, and in others charged with foulneſs, on which the black hue depended.

Theſe gems are lamellated, conſiſting of very thin plates like thoſe of talc, but very cloſely united; the direction of which muſt be found out by lapidaries before they can work them properly: Such as have their foliated ſubſtance not in a flat poſition, are called by the workmen *diamonds of nature*.

The names of *oriental* and *occidental*, given by jewellers to this and all other precious ſtones, have a different meaning from the obvious ſenſe; the fineſt and hardeſt being always called *oriental*, whether they be produced in the eaſt or not. Thoſe called *occidental* are of inferior value; but according to Mr Jefferies, who has written a treatiſe on the ſubject, the diamonds of Braſil equal the fineſt oriental ones. The art of cutting theſe gems was invented in 1476 by Louis de Berquen a native of Bruges in the Auſtrian Netherlands. This ſtone becomes luminous in the dark, by expoſure during a certain time to the rays of the ſun; by heating it in a crucible; by plunging it in boiling water; or by rubbing it with a piece of glaſs. By friction it acquires an electrical property, by which it attracts the ſubſtance uſed for foils called *black maſtic*, and other light matters. The author of the Chemical Dictionary ſays, that diamonds are refractory in the fire, and even apyrous. Nevertheleſs, experiments have been made, which prove that diamonds are capable of being diſſipated, not only by the collected heat of the ſun, but alſo by the heat of a furnace. Mr Boyle ſays, that he perceived certain acrid and penetrating exhalations from diamonds expoſed to fire. A diamond by expoſure to a concave ſpeculum, the diameter of which was 40 inches, was reduced to an eighth part of its weight *. In the *Giornale de Letterati d' Italia, tom.* viii. *art.* 9. we may read a relation of experiments made on precious ſtones, by order of the grand duke of Tuſcany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another ſmaller lens. By theſe experiments we find, that diamonds were more altered by ſolar heat than moſt of the other precious ſtones, although not the leaſt appearance of a commencing fuſion was obſervable. A diamond weighing 30 grains, thus expoſed during 30 ſeconds, loſt its colour, luſtre, and tranſparency, and became of an opaque white. In five minutes, bubbles appeared on its ſurface; ſoon afterwards it burſt into pieces, which were diſſipated; and the ſmall fragment which remained was capable of being cruſhed into fine powder by the preſſure of the blade of a knife. Neither the addition of glaſs, flints, ſulphur, metals, or ſalt of tartar, prevented this diſſi-

* *Philoſ. Tranſac.* n° 386.

pation of diamonds, or occaſioned any degree of fuſion. By this heat rubies were ſoftened, and loſt ſome of their colour, but preſerved their form and weight. By addition of a third lens, a further degree of fuſion was given to rubies. Even then rubies could not be made to unite with glaſs. By having been expoſed to this heat, the ſurface of the rubies which had ſuffered fuſion, loſt much of their original hardneſs, and were nearly as ſoft as cryſtal. But their internal parts, which had not been fuſed, retained their hardneſs. Emeralds by this heat were rendered white, or of various colours, and ſoon afterwards were fuſed. They were found to have loſt part of their weight, and to be rendered leſs hard and brittle.

Experiments were alſo made by order of the emperor Francis I. on precious ſtones; from which we find, that diamonds were entirely diſſipated by having been expoſed in crucibles to a violent fire of a furnace during 24 hours; while rubies by the ſame heat were not altered in weight, colour, or poliſh. By expoſing diamonds during two hours only at a time, the following alterations produced on them by fire were obſerved. Firſt, they loſt their poliſh; then they were ſplit into thin plates; and, laſtly, totally diſſipated. By the ſame fire, emeralds were fuſed. *See Magaſin de Hambourg, tom.* xviii.

The action of fire on diamonds has, notwithſtanding the above mentioned experiments, been lately doubted in France; and the queſtion has been agitated by ſeveral eminent chemiſts with much intereſt, and numerous experiments have been made which throw ſome light on the ſubject. M. D'Arcet found, not only that diamonds included in porcelain crucibles cloſe, or covered with perforated lids, and expoſed to the long and intenſe heat of a porcelain furnace, were perfectly diſſipated; but alſo, that theſe ſtones could in a few hours be totally volatiliſed with a much inferior degree of heat, by expoſing them in a coppel, under the muffle of an eſſay-furnace. In this latter experiment, he obſerved that the diſſipation was gradual, and that it was effected by a kind of exfoliation. The diſſipation of diamonds expoſed in coppels was confirmed by M. Macquer; who further obſerved, that the diamonds were, before the diſſipation began, rendered, by the fire, brilliant and ſhining, as it were, with a phoſphoric light. In order to determine whether the diſſipation of diamonds was actually effected by their reduction into vapour, or by a combuſtion or other effect of air upon them, Meſſrs Lavoiſier, Macquer, and Cadet, expoſed diamonds to intenſe heat in an earthen retort, during ſeveral hours, but without any other effect than that their poliſh was deſtroyed, and about $\frac{1}{4}$th of their weight diminiſhed. M. Mitouard put diamonds in a tobacco-pipe filled with pounded charcoal and accurately cloſed with lute. He further ſecured the diamonds from acceſs of air or flame, by placing the tobacco-pipe in a crucible, to which another crucible was inverted and carefully luted. The diamonds, thus ſecluded from external air, having been expoſed to the moſt intenſe heat which could be excited in a well conſtructed furnace, were not thereby altered or diminiſhed. M. Mitouard was induced to believe, that the charcoal conduced to the preſervation of diamonds not merely by excluding the air, but by ſome peculiar property, which he ſuppoſes may be the ſame as that by which this ſubſtance defends metals from deſtruction by fire. He was confirmed in his opinion, by obſerving that diamonds were not preſerved from the action of fire by ſurrounding them with powder of chalk and of calcined hartſhorn, and including them in cloſe veſſels, ſo well as when the charcoal had been employed. Some chemiſts even thought that the perfect excluſion of air alone was ſufficient to preſerve diamonds, and doubted whether the balls and crucibles of porcelain employed by M. D'Arcet had excluded the air with ſufficient accuracy. Indeed, in one of M. D'Arcet's own experiments, a diamond included in a ball of porcelain had reſiſted the action of fire. In order to aſcertain this queſtion, M. Cadet expoſed diamonds in covered and luted crucibles to the violent heat of a forge during two hours; by which operation the diamonds loſt only $\frac{1}{16}$th part of their weight. He infers, that the deſtruction of diamonds by fire in open veſſels is not a true volatilization; but merely an exfoliation, cauſed by the fire expanding the air contained between the thin plates of which theſe ſtones conſiſt, and that by this exfoliation or decrepitation theſe plates are reduced to ſo fine a powder as to eſcape obſervation. M. D'Arcet objected againſt the experiments of his adverſaries, that they were not of ſufficient duration to decide againſt his, which had laſted ſeveral days. He renewed and multiplied his experiments, which confirmed him in his opinion of the volatilization of diamonds in veſſels perfectly cloſed; and that this effect of fire on diamonds is not a mere exfoliation or mechanical ſeparation of the plates of which theſe ſtones conſiſt, he infers from the parts of the diamonds pervading the moſt ſolid porcelain crucibles without being perceptible, and from the luminous appearance firſt noticed by M. Macquer, and which was afterwards obſerved by M. Roux to be an actual flame.

Diamonds are found only in the Eaſt Indies, and in Braſil in South America. The diamond mines are found only in the kingdoms of Golconda, Viſapour, Bengal, and the iſland of Borneo. There are four mines, or rather two mines and two rivers, whence diamonds are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five days journey from Golconda, and eight from Viſapour. It has been diſcovered about 200 years. 2. That of Gani, or Coulour, ſeven days journey from Golconda eaſtwardly. It was diſcovered 140 years ago by a peaſant, who digging in the ground found a natural fragment of 25 carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the Diamond-mine. This is the moſt ancient of them all: it ſhould rather be called that of *Goual*, which is the name of the river, in the ſand whereof theſe ſtones are found. Laſtly, the fourth mine, or rather the ſecond river, is that of Succudan, in the iſland of Borneo.

Diamond-Mine of Raolconda.—In the neighbourhood of this mine the earth is ſandy, and full of rocks and copſe. In theſe rocks are found ſeveral little veins of half and ſometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the ſand or earth wherein the diamonds are; breaking the rocks when the vein terminates, that the track may be found again, and continued. When a ſufficient quantity of earth or ſand is drawn forth, they waſh it two or three times, to ſeparate the ſtones therefrom.

from. The miners work quite naked, except for a thin linen cloth before them; and beſides this precaution, have likewiſe inſpectors, to prevent their concealing of ſtones: which, however, maugre all this care, they frequently find means to do, by watching opportunities when they are not obſerved, and ſwallowing them down.

Diamond-Mine of Gani or Coulour.—In this mine are found a great number of ſtones from 10 to 40 carats, and even more; and it was here that famous diamond of Aureng-Zeb the Great Mogul, which before it was cut weighed 793 carats, was found. The ſtones of this mine are not very clear; their water is uſually tinged with the quality of the ſoil; being black where that is marſhy, red where it partakes of red, ſometimes green and yellow, if the ground happen to be of thoſe colours. Another defect of ſome conſequence is a kind of greaſineſs appearing on the diamond, when cut, which takes off part of its luſtre.—There are uſually no leſs than 60,000 perſons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another ſomewhat bigger in the neighbourhood thereof, and incloſe it with walls about two feet high, only leaving apertures from ſpace to ſpace, to give paſſage to the water. After a few ſuperſtitious ceremonies, and a kind of feaſt which the maſter of the mine makes for the workmen, to encourage them, every one goes to his buſineſs, the men digging the earth in the place firſt diſcovered, and the women and children carrying it off into the other walled round. They dig 12 or 14 feet deep, and till ſuch time as they find water. Then they ceaſe digging; and the water thus found ſerves to waſh the earth two or three times, after which it is let out at an aperture reſerved for that end. This earth being well waſhed, and well dried, they ſift it in a kind of open ſieve, or riddle, much as we do corn in Europe; then thraſh it, and ſift it afreſh; and laſtly, ſearch it well with the hands to find the diamonds. They work naked as in the mine of Raolconda, and are watched after the like manner by inſpectors.

Diamond-Mine of Soumelpour, or river Goual.—Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its paſſing from the high mountains towards the ſouth to the Ganges, where it loſes its name. It is from this river that all our fine diamond points, or ſparks, called *natural ſparks*, are brought. They never begin to ſeek for diamonds in this river till after the great rains are over, that is, after the month of December; and they uſually even wait till the water is grown clear, which is not before January. The ſeaſon at hand, eight or ten thouſand perſons, of all ages and ſexes, come out of Soumelpour and the neighbouring villages. The moſt experienced among them ſearch and examine the ſand of the river, going up it from Soumelpour to the very mountain whence it ſprings. A great ſign that there are diamonds in it, is the finding of thoſe ſtones which the Europeans call *thunder-ſtones*. When all the ſand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge diamonds likely to be found; which is done after the following manner: They dam the place round with ſtones, earth, and faſcines, and lading out the water, dig about two feet deep: the ſand thus got is carried into a place walled round on the bank of the river. The reſt is performed after the ſame manner as at Coulour, and the workmen are watched with equal ſtrictneſs.

Diamond-Mine in the iſland of Borneo, or river of Succudan.—We are but little acquainted with this mine; the queen who reigns in that part of the iſland not allowing ſtrangers to have any commerce in theſe ſtones: though there are very fine ones to be bought at Batavia, brought thither by ſtealth. They were anciently imagined to be ſofter than thoſe of the other mines; but experience ſhows they are in no reſpect inferior to them.

Beſide theſe four diamond-mines, there have been two others diſcovered; one of them between Coulour and Raolconda, and the other in the province of Carnatica; but they were both cloſed up almoſt as ſoon as diſcovered: that of Carnatica, becauſe the water of the diamonds was always either black or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

The diamond, we have already obſerved, is the hardeſt of all precious ſtones. It can only be cut and ground by itſelf and its own ſubſtance. To bring it to that perfection which augments its price ſo conſiderably, they begin by rubbing ſeveral againſt each other, while rough; after having firſt glued them to the ends of two wooden blocks, thick enough to be held in the hand. It is this powder thus rubbed off the ſtones, and received in a little box for the purpoſe, that ſerves to grind and poliſh the ſtones.

Diamonds are cut and poliſhed by means of a mill, which turns a wheel of ſoft iron ſprinkled over with diamond-duſt mixed with oil of olives. The ſame duſt, well ground, and diluted with water and vinegar, is uſed in the ſawing of diamonds; which is performed with an iron or braſs wire, as fine as a hair. Sometimes, in lieu of ſawing the diamonds, they cleave them, eſpecially if there be any large ſhivers therein. But the Europeans are not uſually daring or expert enough to run the riſk of cleaving, for fear of breaking.

The *firſt water* in diamonds means the greateſt purity and perfection of their complexion, which ought to be that of the pureſt water. When diamonds fall ſhort of this perfection, they are ſaid to be of the *ſecond* or *third* water, &c. till the ſtone may be properly called a *coloured one:* for it would be an impropriety to ſpeak of an imperfectly coloured diamond, or one that has other defects, as a ſtone of a bad water only.

Mr Boyle has obſerved, from a perſon much converſant in diamonds, that ſome of theſe gems, in their rough ſtate, were much heavier than others of the ſame bigneſs, eſpecially if they were cloudy or foul; and Mr Boyle mentions one that weighed $8\frac{1}{2}$ grains, which being carefully weighed in water, proved to an equal bulk of that liquor as $2\frac{23}{31}$ to 1. So that, as far as could be judged by that experiment, a diamond weighs not thrice as much as water: and yet, in his table of ſpecific gravities, that of a diamond is ſaid to be to water as 3400 to 1000; that is, as $3\frac{2}{5}$ to 1; and therefore, according to theſe two accounts, there ſhould be ſome diamonds whoſe ſpecific gravity differs nearly $\frac{1}{5}$ from that of others. But this is a much greater difference than can be expected in two bodies of the ſame ſpecies; and indeed, on an accurate trial, does not prove to be the caſe with diamonds. The Braſil diamonds differ a little in weight one from another, and greatly vary from the ſtandard ſet by Mr Boyle for the ſpecific gravity of this gem in general; two large diamonds from that part of the world being carefully weighed, one was found as 3518, the other as 3521, the ſpecific gravity of water being reckoned 1000. After this, ten Eaſt India diamonds were choſen out of a large parcel, each as different from the other in ſhape, colour, &c. as could be found. Theſe being weighed in the ſame ſcales and water with the former, the lighteſt proved as 3512, the heavieſt as 3525, ſtill ſuppoſing the water to be 1000.—Mr Ellicot, who made theſe experiments, has drawn out a table of their ſeveral differences, which is done with great care and accuracy; and, taking in all the common varieties in diamonds, may ſerve as a general rule for their mean gravity and differences.

	In air.	In water.	Specific gravity
Water - - -			1000
	Grains.	*Grains.*	
N° 1. A Braſil diamond, fine water and rough coat	92,425	66,16	3518
2. Ditto, fine water, rough coat - -	88,21	63,16	3521
3. Ditto, fine bright coat	10,025	7,170	3511
4. Ditto, fine bright coat	9,560	6,830	3501
5. An Eaſt India diamond, pale blue - -	26,485	18,945	3512
6. Ditto, bright yellow -	23,33	16,710	3524
7. Ditto, very fine water, bright coat -	20,66	14,800	3525
8. Ditto, very bad water, honeycomb coat -	20,38	14,590	3519
9. Ditto, very hard bluiſh caſt	22,5	16,1	3515
10. Ditto, very ſoft, good water - -	22,615	16,2	3525
11. Ditto, a very large red foulneſs in it - -	25,480	18,230	3514
12. Ditto, ſoft, bad water	29,525	21,140	3521
13. Ditto, ſoft, brown coat	26,535	18,990	3516
14. Ditto, very deep green coat - -	25,250	18,080	3521
The mean ſpecific gravity of the Braſil diamonds appears to be - -			3513
Of the Eaſt India diamonds - - - -			3519
The mean of both - - - - -			3517

Therefore if any thing is to be concluded as to the ſpecific gravity of the diamond, it is, that it is to water as 3517 to 1000.

For the valuation of diamonds of all weights, Mr Jefferies lays down the following rule. He firſt ſuppoſes the value of a rough diamond to be ſettled at 2 l. per carat, at a medium; then to find the value of diamonds of greater weights, multiply the ſquare of their weight by 2, and the product is the value required. *E. G.* to find the value of a rough diamond of two carats; 2×2=4, the ſquare of the weight; which, multiplied by two, gives 8l. the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he ſuppoſes half their weight to be loſt in manufacturing them; and therefore, to find their value, we muſt multiply the ſquare of double their weight by 2, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we firſt find the ſquare of double the weight, *viz* 4×4=16; then 16×2=32. So that the true value of a wrought diamond of two carats is 32 l. On theſe principles Mr Jefferies has conſtructed tables of the price of diamonds from 1 to 100 carats.

The greateſt diamond ever known in the world is one belonging to the king of Portugal, which was found in Braſil. It is ſtill uncut: and Mr Magellan informs us, that it was of a larger ſize; but a piece was cleaved or broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardneſs by the ſtroke of a large hammer upon the anvil.

This prodigious diamond weighs 1680 carats: and although it is uncut, Mr Romé de l'Iſle ſays, that it is valued at 224 millions ſterling; which gives the eſtimation of 79,36 or about 80 pounds ſterling for each carat: *viz.* for the multiplicand of the ſquare of its whole weight. But even in caſe of any error of the preſs in this valuation, if we employ the general rule above mentioned, this great gem muſt be worth at leaſt 5,644,800 pounds ſterling, which are the product of 1680 by two pounds, *viz.* much above five millions and a half ſterling.

The famous diamond which adorns the ſceptre of the Empreſs of Ruſſia under the eagle at the top of it weighs 779 carats, and is worth at leaſt 4,854,728 pounds ſterling, although it hardly coſt 135,417 guineas. This diamond was one of the eyes of a Malabarian idol, named *Scheringham.* A French grenadier, who had deſerted from the Indian ſervice, contrived ſo well as to become one of the prieſts of that idol, from which he had the opportunity to ſteal its eye: he run away to the Engliſh at Trichinapeuty, and thence to Madras. A ſhip-captain bought it for twenty thouſand rupees: afterwards a Jew gave ſeventeen or eighteen thouſand pounds ſterling for it: at laſt a Greek merchant, named *Gregory Suffras*, offered it to ſale at Amſterdam in the year 1766: and the late prince Orloff made this acquiſition, as he himſelf told Mr Magellan in London, for his ſovereign the empreſs of Ruſſia. Dutens, page 19. and Bomare, page 389. of his Mineralogy, relate the above anecdote. The figure and ſize of this diamond may be ſeen in the Britiſh Muſeum in London: it is far from being of a regular form.

The diamond of the great Mogul is cut in Roſe; weighs $279\frac{9}{16}$ carats, and it is worth 380,000 guineas. This diamond has a ſmall flaw underneath near the bottom: and Tavernier, page 389. who examined it, valued the carat at 150 French livres. Before this diamond was cut, it weighed $793\frac{5}{8}$ carats, according to Romè de l'Iſle: but Tavernier, page 339. of his ſecond volume, ſays, that it weighed 900 carats before it was cut. If this is the very ſame diamond, its loſs by being cut was very extraordinary.

Another diamond of the king of Portugal, which weighs 215 carats, is extremely fine, and is worth at leaſt 369,800 guineas.

The diamond of the grand duke of Tuſcany, now of the emperor of Germany, weighs $139\frac{1}{2}$ carats; and is worth at leaſt 109,520 guineas. Tavernier ſays, that this diamond has a little hue of a citron colour; and he valued it at 135 *livres tournoiſes* the carat. Robert de Berquen ſays, that this diamond was cut into two: that the grand Turk had another of the ſame ſize: and that there were at Biſnagar two large diamonds, one of 250 and another of 140 carats. This Robert de Berquen was the grandſon of Louis de Berquen, who invented the art of cutting diamonds.

The diamond of the king of France, called the *Pitt* or *Regent*, weighs 136¾ carats: this gem is worth at leaſt 208,333 guineas, although it did not coſt above the half of this value.

The other diamond of the ſame monarch, called the *Sancy*, weighs 55 carats: it coſt 25,000 guineas: and Mr Dutens ſays, that it is worth much above that price.

Brilliant Diamond, is that cut in faces both at top and bottom; and whoſe table, or principal face at top, is flat. To make a complete ſquare brilliant, if the rough diamond be not found of a ſquare figure, it muſt be made ſo; and if the work is perfectly executed, the length of the axis will be equal to the ſide of the ſquare baſe of the pyramid.—Jewellers then form the table and collet by dividing the block, or length of the axis, into 18 parts. They take $\frac{5}{18}$ from the upper part, and $\frac{1}{18}$ from the lower. This gives a plane at $\frac{4}{18}$ diſtance from the girdle for the table; and a ſmaller plane at $\frac{5}{18}$ diſtance for the collet; the breadth of which will be $\frac{1}{5}$ of the breadth of the table. In this ſtate the ſtone is ſaid to be a *complete ſquare table* diamond.—The brilliant is an improvement on the table-diamond, and was introduced within the laſt century, according to Mr Jefferies.—To render a brilliant perfect, each corner of the above deſcribed table-diamond, muſt be ſhortened by $\frac{1}{10}$ of its original. The corner ribs of the upper ſides muſt be flattened, or run towards the centre of the table $\frac{1}{8}$ leſs than the ſides; the lower part, which terminates in the girdle, muſt be $\frac{1}{8}$ of one ſide of the girdle; and each corner rib of the under ſides muſt be flattened at the top, to anſwer the above flattening at the girdle, and at bottom muſt be $\frac{1}{4}$ of each ſide of the collet.

The parts of the ſmall work which completes the brilliant, or the ſtar and ſkill facets, are of a triangular figure. Both of theſe partake equally of the depth of the upper ſides from the table to the girdle; and meet in the middle of each ſide of the table and girdle, as alſo at the corners. Thus they produce regular lozenges on the four upper ſides and corners of the ſtone. The triangular facets, on the under ſides, joining to the girdle, muſt be half as deep again as the above facets, to anſwer to the collet part.—The ſtone here deſcribed is ſaid to be a *full-ſubſtanced brilliant.*—If the ſtone is thicker than in the proportion here mentioned, it is ſaid to be an *over-weighted brilliant.*—If the thickneſs is leſs than in this proportion, it is called a *ſpread-brilliant.*—The beauty of brilliants is diminiſhed from their being either over-weighted or ſpread. The true proportion of the axis, or depth of the ſtone to its ſide, is as 2 to 3.—Brilliants are diſtinguiſhed into ſquare, round, oval, and drops, from the figure of their reſpective girdles.

Corniſh Diamond, a name given by many people to the cryſtals found in digging the mines of tin in Cornwal. Theſe cryſtals are of the nature of the Kerry-ſtone of Ireland, but ſomewhat inferior to it: they are uſually bright and clear, except towards the root, where they are coarſe and foul, or whitiſh. They are uſually found in the common form of an hexangular column terminated at each end by an hexangular pyramid.

Roſe-Diamond is one that is quite flat underneath, with its upper part cut in divers little faces, uſually triangles, the uppermoſt of which terminate in a point.—In roſe-diamonds, the depth of the ſtone from the baſe to the point muſt be half the breadth of the diameter of the baſe of the ſtone. The diameter of the crown muſt be $\frac{2}{5}$ of the diameter of the baſe. The perpendicular, from the baſe to the crown, muſt be $\frac{3}{5}$ of the diameter of the ſtone. The lozenges which appear in all circular roſe-diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the ſtone, and the lower in the baſe or girdle.

Rough Diamond, is the ſtone as nature produces it in the mines.

A rough diamond muſt be choſen uniform, of a good ſhape, tranſparent, not quite white, and free of flaws and ſhivers. Black, rugged, dirty, flawey, veiny ſtones, and all ſuch as are not fit for cutting, they uſe to pound in a ſteel mortar made for that purpoſe; and when pulverized, they ſerve to ſaw, cut, and poliſh the reſt. Shivers are occaſioned in diamonds by this, That the miners, to get them more eaſily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which ſhakes, and fills the ſtone with cracks and ſhivers. The ancients had two miſtaken notions with regard to the diamond: the firſt, that it became ſoft, by ſteeping it in hot goat's blood; and the ſecond, that it is malleable, and bears the hammer. Experience ſhows us the contrary; there being nothing capable of mollifying the hardneſs of this ſtone; tho' its hardneſs be not ſuch, that it will endure being ſtruck at pleaſure with the hammer.

Factitious Diamonds. Attempts have been made to produce artificial diamonds, but with no great ſucceſs.—Theſe made in France, called *temple diamonds*, on account of the temple at Paris, where the beſt of them are made, fall vaſtly ſhort of the genuine ones; accordingly they are but little valued, though the conſumption thereof is pretty conſiderable for the habits of the actors on the ſtage, &c. See Pastes.

Diamond, in the glaſs-trade, an inſtrument uſed for ſquaring the large plates or pieces; and, among glaziers, for cutting their glaſs.

Theſe ſorts of diamonds are differently fitted up. That uſed for large pieces, as looking-glaſſes, &c. is ſet in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is alſo a handle of box or ebony fitted to the ferril, for holding it by.

Diamond, in heraldry, a term uſed for expreſſing the black colour in the atchievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious ſtones inſtead of metals and colours; but the Engliſh practice allows it. Morgan ſays the diamond is an emblem of fortitude.

DIANA, the goddeſs of hunting. According to

Cicero, there were three of this name: a daughter of Jupiter and Proſerpine, who became mother of Cupid; a daughter of Jupiter and Latona; and a daughter of Upis and Glauce. The ſecond is the moſt celebrated, and to her all the ancients allude. She was born at the ſame birth as Apollo; and the pains which ſhe ſaw her mother ſuffer during her labour gave her ſuch an averſion to marriage, that ſhe obtained of her father to live in perpetual celibacy, and to preſide over the travails of women. To ſhun the ſociety of men, ſhe devoted herſelf to hunting; and was always accompanied by a number of choſen virgins, who like herſelf abjured the uſe of marriage. She is repreſented with a quiver and attended with dogs, and ſometimes drawn in a chariot by two white ſtags. Sometimes ſhe appears with wings, holding a lion in one hand and a panther in the other, with a chariot drawn by two heifers, or two horſes of different colours. She is repreſented as tall; her face has ſomething manly; her legs are bare, well ſhaped, and ſtrong; and her feet are covered with a buſkin worn by huntreſſes among the ancients. She received many ſurnames, particularly from the places where her worſhip was eſtabliſhed, and from the functions over which ſhe preſided. She was called *Lucina*, *Ilythia*, or *Juno Pronuba*, when invoked by women in childbed; and *Trivia* when worſhipped in the croſs-ways, where her ſtatues were generally erected. She was ſuppoſed to be the ſame as the moon and Proſerpine or Hecate, and from that circumſtance ſhe was called *Triformis;* and ſome of her ſtatues repreſented her with three heads, that of a horſe, a dog, and a boar. Her power and functions under theſe three characters have been beautifully expreſſed in theſe two verſes:

> *Terret, luſtrat, agit, Proſerpina, Luna, Diana,*
> *Ima, ſuprema, feras, ſceptro, fulgore, ſagitta.*

She was alſo called *Agrotera*, *Orithia*, *Taurica*, *Delia*, *Cynthia*, *Aricia*, &c. She was ſuppoſed to be the ſame as the Iſis of the Egyptians, whoſe worſhip was introduced into Greece with that of Oſiris under the name of Apollo. When Typhon waged war againſt the gods, Diana metamorphoſed herſelf into a cat to avoid his fury. She is generally known, in the figures that repreſent her, by the creſcent on her head, by the dogs which attend her, and by her hunting habit. The moſt famous of her temples was that of Epheſus, which was one of the ſeven wonders of the world: (See Epheſus). She was there repreſented with a great number of breaſts, and other ſymbols which ſignified the earth or Cybele. Though ſhe was the patroneſs of chaſtity, yet ſhe forgot her dignity to enjoy the company of Endymion, and the very familiar favours which ſhe granted to Pan and Orion are well known: (See Endymion, Pan, Orion). The inhabitants of Taurica were particularly attached to the worſhip of this goddeſs, and they cruelly offered on her altar all the ſtrangers that were ſhipwrecked on their coaſts. Her temple in Aricia was ſerved by a prieſt who had always murdered his predeceſſor; and the Lacedemonians yearly offered her human victims till the age of Lycurgus, who changed this barbarous cuſtom for the ſacrifice of flagellation. The Athenians generally offered her goats; and others a white kid, and ſometimes a boar pig or an ox. Among plants, the poppy and the ditany were ſacred to her. She, as well as her brother Apollo, had ſome oracles; among which thoſe of Egypt, Cilicia, and Epheſus, are the moſt known.

DIANÆ arbor, or Arbor Lunæ, in chemiſtry, the beautiful cryſtallizations of ſilver, diſſolved in aquafortis, to which ſome quickſilver is added: and ſo called from their reſembling the trunk, branches, leaves, &c. of a tree. See Chemistry, n° 754.

Dianæ Fanum, (anc. geog.), a promontory of Bithynia: Now *Scutari*, a citadel oppoſite to Conſtantinople, on the eaſt ſide of the Boſporus Thracius.

Dianæ Portus, a port of Corſica, ſituated between Aleria and Mariana, on the eaſt ſide.

DIANDRIA (from δις *twice*, and ανηρ *a man*), the name of the ſecond claſs in Linnæus's ſexual ſyſtem, conſiſting of hermaphrodite plants; which, as the name imports, have flowers with two ſtamina or male organs.

The orders in this claſs are three, derived from the number of ſtyles or female parts. Moſt plants with two ſtamina have one ſtyle; as jeſſamine, lilac, privet, veronica, and baſtard alaternus: vernal graſs has two ſtyles; pepper, three.

DIANIUM (anc. geog.), a town of the Conteſtani, in the Hither Spain; famous for a temple of Diana, whence the name: Now *Denia*, a ſmall town of Valencia, on the Mediterranean. Alſo a promontory near Dianium: Now *El Cabo Martin*, four leagues from Denia, running out into the Mediterranean.

DIANTHERA, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The corolla is ringent; the capſule bilocular, parting with a ſpring at the heel; the ſtamina each furniſhed with two antheræ placed alternately.—There is only one ſpecies, a native of Virginia and other parts of North America. It is a low herbaceous plant, with a perennial root, ſending out upright ſtalks a foot high, garniſhed with long narrow leaves of an aromatic odour, ſtanding cloſe to the ſtalks. From the ſide of the ſtalks the footſtalks of the flowers are produced, ſuſtaining ſmall ſpikes of flowers.—This plant is very difficult to be preſerved in Britain; for though it is hardy enough to live in the open air, it is very ſubject to rot in winter. It may be propagated by ſeeds ſown on a gentle hot-bed; and in the winter the plants muſt be kept in a dry ſtove.

DIANTHUS, clove-gilliflower, carnation, pink, sweet-william, &c.: A genus of the digynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is cylindrical and monophyllous, with four ſcales at the baſe. There are five petals, with narrow heels; the capſule is cylindrical and unilocular.—There are a great number of ſpecies; but not more than four that have any conſiderable beauty as garden-flowers, each of which furniſhes ſome beautiful varieties. 1. The caryophyllus, or clove-gilliflower, including all the varieties of carnation. It riſes with many ſhort trailing ſhoots from the root, garniſhed with long, very narrow, evergreen leaves; and amidſt them upright ſlender flower-ſtalks, from one to three feet high, emitting many ſide-ſhoots; all of which, as well as the main ſtalk, are terminated by large ſolitary flowers, having ſhort oval ſcales to the calyx, and crenated petals. The varieties of this are very numerous, and unlimited in the diverſity of flowers. 2. The deltoides, or common pink, riſes with numerous ſhort leafy ſhoots crowning the root, in a tufted head cloſe to the ground, cloſely garniſhed with ſmall narrow leaves; and from the ends of the ſhoots many erect flower-ſtalks, from about ſix to 15 inches high, terminated by ſolitary flowers of different colours, ſingle and double, and ſometimes finely variegated. This ſpecies is perennial, as all the varieties of it commonly cultivated alſo are. 3. The Chinenſis, Chineſe, or Indian pink, is an annual plant with upright firm flower-ſtalks, branching erect on every ſide, a foot or 15 inches high, having all the branches terminated by ſolitary flowers of different colours and variegations, appearing from July to November. 4. The barbatus, or bearded dianthus, commonly called *ſweet-william*. This riſes with many thick leafy ſhoots, crowning the root in a cluſter cloſe to the ground; garniſhed with ſpear-ſhaped evergreen leaves, from half an inch to two inches broad. The ſtems are upright and firm, branching erect two or three feet high, having all the branches and main ſtem crowned by numerous flowers in aggregate cluſters of different colours and variegations.

Culture. Though the carnations grow freely in almoſt any garden earth, and in it produce beautiful flowers, yet they are generally ſuperior in that of a light loamy nature: and of this kind of ſoil the floriſts generally prepare a kind of compoſt in the following manner, eſpecially for thoſe fine varieties which they keep in pots. A quantity of loamy earth muſt be provided, of a light ſandy temperature, from an upland or dry paſture-field or common, taking the top ſpit turf and all, which muſt be laid in a heap for a year, and turned over frequently. It muſt then be mixed with about one-third of rotten dung of old hotbeds, or rotten neats dung, and a little ſea-ſand, forming the whole into a heap again, to lie three, four, or ſix months, at which time it will be excellent for uſe; and if one parcel or heap was mixed with one of theſe kinds of dungs, and another parcel with the other, it will make a change, and may be found very beneficial in promoting the ſize of the flowers. This compoſt, or any other made uſe of for the purpoſe, ſhould not be ſifted, but only well broken with the ſpade and hands.—When great quantities of carnations are required, either to furniſh large grounds, or for market, or when it is intended to raiſe new varieties, it is eaſily effected by ſowing ſome ſeed annually in ſpring, in common earth, from which the plants will riſe abundantly. Several good varieties may alſo be expected from the plants of each ſowing; and poſſibly not one exactly like thoſe from which the ſeed was ſaved. The ſingle flowers are always more numerous than the double ones; but it is from the latter only that we are to ſelect our varieties. The ſeaſon for ſowing the ſeed is any time from the 20th of March to the 15th of April. —The plants generally come up in a month after ſowing: they muſt be occaſionally weeded and watered till July, when they will be fit for tranſplanting into the nurſery beds. Theſe beds muſt be made about three feet wide, in an open ſituation; and taking advantage of moiſt weather, prick the plants therein four inches aſunder, and finiſh with a gentle watering, which repeat occaſionally till the plants have taken good root. Here they muſt remain till September, when they will be ſo well advanced in growth as to require more room; and ſhould then have their final tranſplantation into other three feet wide beds of good earth, in rows 9 inches aſunder, where they are to be placed in the order of quincunx. Here they are to remain all winter, until they flower, and have obtained an increaſe of the approved varieties of doubles by layers; and until this period, all the culture they require is, that if the winter ſhould prove very ſevere, an occaſional ſhelter of mats will be of advantage. In ſpring, the ground muſt be looſened with a hoe; they muſt be kept clear from weeds; and when the flower-ſtalks advance, they are to be tied up to ſticks, eſpecially all thoſe that promiſe by their large flower-pods to be doubles.

The only certain method of propagating the double varieties is by layers. The proper parts for layers are thoſe leafy ſhoots ariſing near the crown of the root, which, when about five, ſix, or eight inches long, are of a proper degree of growth for layers. The general ſeaſon for this work is June, July, and the beginning of Auguſt, as then the ſhoots will be arrived at a proper growth for that operation; and the ſooner it is done after the ſhoots are ready the better, that they may have ſufficient time to acquire ſtrength before winter: theſe laid in June and July will be fit to take off in Auguſt and September, ſo will form fine plants in the month of October. The method of performing the work is as follows. Firſt provide a quantity of ſmall hooked ſticks for pegs. They muſt be three or four inches long, and their uſe is to peg the layers down to the ground. Get ready alſo in a barrow a quantity of light rich mould, to raiſe the earth, if neceſſary, round each plant, and provide alſo a ſharp penknife. The work is begun by ſtripping off all the leaves from the body of the ſhoots, and ſhortening thoſe at top an inch or two evenly. Then chooſing a ſtrong joint on the middle of the ſhoot or thereabouts, and on the back or under ſide thereof, cut with the penknife the joint half-way through, directing your knife upward ſo as to ſlit the joint up the middle, almoſt to the next joint above, by which you form a kind of tongue on the back of the ſhoot; obſerving that the ſwelling ſkinny part of the joint remaining at the bottom of the tongue muſt be trimmed off, that nothing may obſtruct the iſſuing of the fibres; for the layers always form their roots at that part. This done, looſen the earth about the plant; and, if neceſſary, add ſome freſh mould, to raiſe it for the more ready reception of the layers; then with your finger make a hollow or drill in the earth to receive the layer; which bend horizontally into the opening, raiſing the top upright, ſo as to keep the gaſh or ſlit part of the layer open; and, with one of the hooked ſticks, peg down the body of the layer, to ſecure it in its proper place and poſition, ſtill preſerving the top erect and the ſlit open, and draw the earth over it an inch or two, bringing it cloſe about the erect part of the ſhoot; and when all the ſhoots of each plant are thus laid, give directly ſome water to ſettle the earth cloſe, and the work is finiſhed. In dry weather the waterings muſt be often repeated, and in five or ſix weeks the layers will have formed good roots. They muſt then be ſeparated with a knife from the old plant, gently raiſed out of the earth with the point of a knife or trowel, in order to preſerve the fibrous roots of the layers as entire

tire as poſſible; and when thus taken up, cut off the naked ſticky part at bottom cloſe to the root, and trim the tops of the leaves a little. They are then ready for planting either into beds or pots. In November the fine varieties in pots ſhould be moved to a ſunny ſheltered ſituation for the winter; and if placed in a frame, to have occaſional protection from hard froſt, it will be of much advantage. In the latter end of February, or ſome time in March, the layers in the ſmall pots, or ſuch as are in beds, ſhould be tranſplanted with balls into the large pots, where they are to remain for flower. To have as large flowers as poſſible, curious floriſts clear off all ſide-ſhoots from the flower-ſtem, ſuffering only the main or top buds to remain for flowering. When the flowers begin to open, attendance ſhould be given to aſſiſt the fine varieties, to promote their regular expanſion, particularly the largeſt kinds called *burſters*, whoſe flowers are ſometimes three or four inches diameter. Unleſs theſe are aſſiſted by art, they are apt to burſt open on one ſide, in which caſe the flower will become very irregular: therefore, attending every day at that period, obſerve, as ſoon as the calyx begins to break, to cut it a little open at two other places in the indenting at top with narrow-pointed ſciſſars, and hereby the more regular expanſion of the petals will be promoted: obſerving, if one ſide of any flower comes out faſter than another, to turn the pot about, that the other ſide of the flower may be next the ſun, which will alſo greatly promote its regular expanſion. When any fine flower is to be blown as large and ſpreading as poſſible, floriſts place ſpreading paper collars round the bottom of the flowers, on which they may ſpread their petals to the utmoſt expanſion. Theſe collars are made of ſtiff white paper, cut circular about three or four inches over, having a hole in the middle to receive the bottom of the flower, and one ſide cut open to admit it. This is to be placed round the bottom of the petals in the inſide of the calyx, the leaves of which are made to ſpread flat for its ſupport. The petals muſt then be drawn out and ſpread upon the collar to their full width and extent; the longeſt ones undermoſt, and the next longeſt upon theſe; and ſo on; obſerving that the collar muſt no where appear wider than the flower; and thus a carnation may be rendered very large and handſome.

Theſe directions will anſwer equally well for the propagation of the pinks and ſweet-williams, though neither of theſe require ſuch nicety in their culture as the carnations.

DIAPASON, in muſic, a muſical interval, by which moſt authors who have wrote on the theory of muſic uſe to expreſs the OCTAVE of the Greeks.

DIAPASON, among the muſical inſtrument-makers, a kind of rule or ſcale whereby they adjuſt the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, ſemitones, and concords, juſt.

DIAPASON-Diaex, in muſic, a kind of compound concord, whereof there are two ſorts; the greater, which is in the proportion of 10-3; and the leſſer, in that of 16-5.

DIAPASON Diapente, in muſic, a compound conſonance in a triple ratio, as 3-9. This interval, ſays Martianus Capella, conſiſts of 9 tones and a ſemitone; 19 ſemitones, and 38 dieſes. It is a ſymphony made when the voice proceeds from the firſt to the twelfth ſound.

DIAPASON Diateſſaron, in muſic, a compound concord founded on the proportion of 8 to 3. To this interval Martianus Capella allows 8 tones and a ſemitone; 17 ſemitones, and 34 dieſes. This is when the voice proceeds from its firſt to its eleventh ſound. The moderns would rather call it the *eleventh*.

DIAPASON Ditone, in muſic, a compound concord, whoſe terms are as 10-4, or as 5-2.

DIAPASON Semiditone, in muſic, a compound concord, whoſe terms are in the proportion of 12-5.

DIAPEDESIS, in medicine, a tranſudation of the fluids through the ſides of the veſſels that contain them, occaſioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENTE, in the ancient muſic, an interval marking the ſecond of the concords, and with the diateſſaron an octave. This is what in the modern muſic is called a *fifth*.

DIAPHANOUS, an appellation given to all tranſparent bodies, or ſuch as tranſmit the rays of light.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the ſkin. See PERSPIRATION.

DIAPHORETICS, among phyſicians, all medicines which promote perſpiration.

DIAPHRAGM, DIAPHRAGMA, in anatomy, a part popularly called the *midriff*, and by anatomiſts *ſeptum tranſverſum*. It is a nervous muſcle, ſeparating the breaſt or thorax from the abdomen or lower venter, and ſerving as a partition between the natural and the vital parts, as they are called. See ANATOMY, n° 115.

It was Plato, as Galen informs us, that firſt called it *diaphragm*, from the verb διαφραττειν, *to ſeparate* or *be between two*. Till his time it had been called φρενες, from a notion that an inflammation of this part produced phrenſy; which is not at all warranted by experience, any more than that other tradition, that a tranſverſe ſection of the diaphragm with a ſword cauſes the patient to die laughing.

DIAPORESIS, Διαπορησις, in rhetoric, is uſed to expreſs the heſitation or uncertainty of the ſpeaker.

We have an example in Homer, where Ulyſſes, going to relate his ſufferings to Alcinous, begins thus:

> *Τι πρωτον, τι δ' επειτα, τι δ' υστατιον καταλεξω?*
> *Quid primum, quid deinde, quid poſtremo alloquar?*

This figure is moſt naturally placed in the exordium or introduction to a diſcourſe. See DOUBTING.

DIARBECK, or DIARBEKR, an extenſive province of Eaſtern Aſiatic Turky; comprehending, in its lateſt extent, *Diarbekr*, properly ſo called, *Terack* or *Chaldea*, and *Curdiſtan*, which were the ancient countries of Meſopotamia, Chaldea, and Aſſyria, with Bybylon. It is called *Diarbeck*, *Diarbeker*, or *Diarbekr*, as ſignifying the "duke's country," from the word *dhyar* "a duke, and *bekr* "country." It extends along the banks of the Tigris and Euphrates from north-north-weſt to ſouth-eaſt, that is, from Mount Taurus, which divides it from Turcomania on the north, to the inmoſt receſs of the Perſian gulph on the ſouth, about 600 miles; and from eaſt to weſt, that is, from Perſia on the eaſt to Syria and Arabia Deſerta on the weſt, in ſome places 200, and in others about 300, miles, but in the ſouthern or lower parts not above 150. As extending alſo from the 30th to the 38th degree of latitude, it lies under part of the fifth and ſixth climates whoſe longeſt day is about 14 hours and a half, and ſo in proportion, and conſequently enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile ſoil. There are indeed, as in all hot countries, ſome large deſerts in it, which produce no ſuſtenance for men or cattle, nor have any inhabitants. Being a conſiderable frontier towards the kingdom of Perſia, it is very well guarded and fortified; but as for thoſe many cities once ſo renowned for their greatneſs and opulence, they are at preſent almoſt dwindled into heaps of ruins. Bagdad, Moſſul, Carahmed, and a few more, indeed continue to be populous and wealthy; but the reſt can ſcarce be called by any other name than that of ſorry places. The rivers Euphrates and Tigris have almoſt their whole courſe through this country.

Diarbeck Proper is bounded on the north by Turcomania, on the weſt by Syria, on the ſouth by part of Arabia Deſerta and Yrack Proper, and on the eaſt by Curdiſtan. It was named by Moſes *Padan Aram;* the latter being the general name of Syria; and the former ſignifying *fruitful*, a proper epithet for this country, which is really ſo to a very high degree, eſpecially on the northern ſide, where it yields corn, wine, oil, fruits, and all neceſſaries of life in great abundance. Formerly it was the reſidence of many famed patriarchs, yet was over-run with the groſſeſt idolatry, not only in the time of Abraham's coming out of it, and Jacob's ſojourning in it, but likewiſe during the time it continued under the dominion of the Aſſyrians, Babylonians, Medes, Perſians, and Romans. It received indeed the light of the goſpel ſoon after our Saviour's aſcenſion, from St Thaddæus, who is ſaid to have been ſent thither by St Thomas, at the requeſt of Agbarus king of Edeſſa. This account, together with that monarch's letter to Jeſus Chriſt, we have from Euſebius, who took it from the archives of that city; and the whole had paſſed current and uncontradicted for many ages, till our more enlightened moderns found reaſons to condemn it; but whether right or wrong, it plainly appears that Chriſtianity flouriſhed here in a moſt eminent manner, till its purity was ſullied about the beginning of the ſixth century by the hereſy of the Jacobites, whoſe patriarch ſtill reſides here, with a juriſdiction over all that ſect in the Turkiſh dominions.

Diarbeck Proper, is a beglerbegate, under which are reckoned twelve ſangiacs; and the principal towns in it are, Diarbekir or Caramed, Rika, Mouſſul, Orſa or Edeſſa, Elbir, Niſibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Caraſara; but all now of little note excepting Diarbekir and Mouſſul.

Diarbekir, the capital of the above diſtrict, is ſituated in a delightful plain, on the banks and near the head of the Tigris, about 155 miles or 15 caravan days journey, north-eaſt from Aleppo, in latitude 37° 35′, eaſt longitude 40° 50′. The bridge of 10 arches over the ſaid river is ſaid to have been built by the order of Alexander the Great. It is one of the richeſt and moſt mercantile cities in all Aſiatic Turkey; and is well fortified, being encompaſſed with a double wall, the outermoſt of which is flanked, with 72 towers, ſaid to have been raiſed in memory of our Saviour's 72 diſciples. It has ſeveral ſtately piazzas or market-places, well ſtored with all kinds of rich merchandize, and 12 magnificient moſques, ſaid to have been formerly Chriſtian churches. Its chief manufacture is the dreſſing, tanning, and dying of goat-ſkins, commonly called *Turkey leather*, of which the vent is almoſt incredible in many parts of Europe and Aſia: beſides this, there is another of dyed fine linen and cotton cloths, which are nearly in the ſame requeſt. The waters of the Tigris are reckoned extraordinary for thoſe two branches of trade, and give red leather a finer grain and colour than any other. There is a good number of large and convenient inns on both ſides of the river, for the caravans that go to and from Perſia; and on the road near the town is a chapel with a cupola, where Job is ſaid to lie buried. This place is much frequented by pilgrims of all nations and religions, and a Turkiſh hermit has a cell cloſe to it. The fair ſex, who, in moſt other parts of the Turkiſh empire, are kept quite immured, and conſidered as mere ſlaves, enjoy here an extraordinary liberty, and are commonly ſeen on the public walks of the city in company with the Chriſtian women, and live in great friendſhip and familiarity with them. The ſame is ſaid of the men, who are polite, affable, and courteous, and very different from what they affect to be, eſpecially the Turks, in other cities of this empire. The city is under the government of a baſha, who has great power and very large dominions. He has commonly a body of 20,000 horſe under him, for repelling the frequent incurſions of the Curdes and Tartars, who always go on horſeback to rob the caravans. The adjacent territory is very rich and beautiful; the bread, wine, and fleſh excellent; the fruits exquiſite, and the pigeons better and larger than any in Europe.

Mr Ives, who paſſed through this city in 1758, informs us, that "about two years ago it was very populous, its inhabitants amounting to 400,000 ſouls; but in the laſt year 300,000 died either by cold or famine. The Chriſtians reſiding in the city before this calamity were reckoned to amount to 26,000, of whom 20,000 died. This account we had from one of the French miſſionaries, a capuchin, who alſo ſaid, that before the famine the city contained 60,000 fighting men, but that now they are not able to muſter 10,000. He aſſures us, that the houſes and ſtreets, nay the very moſques, were filled with dead; that every part of the city exhibited a dreadful image of death; and that the ſurviving inhabitants not only greedily devoured all kinds of beaſts, brutes, and reptiles, but alſo were obliged to feed on human bodies. Yet, in the midſt of this ſcene of horror, the grandees of the city had every thing in plenty; for they had taken care to monopolize vaſt quantities of corn, which they ſold out to the other inhabitants at moſt extravagant prices, and thereby acquired for themſelves immenſe fortunes. Corn roſe from two piaſtres a meaſure to 50, 60, and even 70, in the ſpace of ſix months. The father added, that the very ſevere winter of 1756, and the locuſts in 1757, were the cauſes of this dreadful viſitation: for by reaſon of the former, there were but few acres of land ſown with corn; and by the latter, the ſmall crop they had was in a great meaſure deſtroyed. He ſpoke of the ſeverity of that winter in terms almoſt incredible: that it was common to ſee the people fall down dead in the ſtreets; that he himſelf once on quitting a warm room, and going into the open air, fell down motionleſs; and that his brother, in attempting to aſſiſt him, met with the ſame fate." This account of the effects of cold in the city of Diarbekir, which lies only in about 38° north, ſeems at firſt very ſurpriſing; but conſidering that the place ſtands on a riſing ground in the midſt of an extenſive plain, and that the high Courdiſtan mountains lie to the ſouth and eaſt of it, and the Armenian or Turcomanian to the north, whoſe heads are always covered with ſnow, and even now in July ſupply the city with ice; it will not appear at all improbable, that in a very ſevere winter, ſuch as was that in 1756, the inhabitants of this city ſhould ſo ſeverely feel the effects of it. Beſides, fuel muſt have been extremely ſcarce, eſpecially among the poorer ſort, as nothing of this kind is produced but upon the mountains, and theſe lie at ſuch a diſtance that the price of it muſt thereby be greatly enhanced.

DIARRHŒA, or LOOSENESS, in medicine, is a frequent and copious evacuation of liquid excrement by ſtool. See (the *Index* ſubjoined to) MEDICINE.

DIARTHROSIS, in anatomy, a kind of articulation or juncture of the bones; which being pretty lax, affords room for a manifeſt motion. The word comes from δια, and αρθρον, *juncture, aſſemblage*. It is oppoſed to *ſynarthroſis*, wherein the articulation is ſo cloſe that there is no ſenſible motion at all. See ANATOMY, n° 2.

DIARY, a term ſometimes uſed for a journal or day-book, containing an account of every day's proceedings. Thus we ſay, *diaries of the weather*, &c.

DIARY Fever, is a fever of one day. See EPHEMERA.

DIASCHISM, among muſicians, denotes the difference between the comma and enharmonic dieſis, commonly called the *leſſer comma*.

DIASCORDIUM, in pharmacy, a celebrated compoſition, ſo called from *ſcordium*, one of its ingredients. See PHARMACY.

DIASTOLE, among phyſicians, ſignifies the dilatation of the heart, auricles, and arteries; and ſtands oppoſed to the SYSTOLE, or contraction of the ſame parts. See ANATOMY, n° 124.

DIASTOLE, in grammar, a figure in proſody whereby a ſyllable naturally ſhort is made long. Such is the firſt ſyllable of *Priamides* in the following verſe of Virgil:

Atque hic Priamides! nihil o tibi, amice, relictum.

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of ſome low, ridiculous thing.

DIATESSARON, among ancient muſicians, a concord or harmonical interval, compoſed of a greater tone, a leſs tone, and one greater ſemitone: its proportion in numbers is as 4 : 3.

DIATONICK, in muſic, (compounded of two Greek words, *viz.* the prepoſition δια, ſignifying a tranſition from one thing to another, and the ſubſtantive τονος, importing a given degree of tenſion or muſical note), is indifferently applied to a ſcale or gammut, to intervals of a certain kind, or to a ſpecies of muſic, whether in melody or harmony, compoſed of theſe intervals. Thus we ſay the *diatonick* ſeries, a *diatonick* interval, *diatonick* melody or harmony. As the diatonick ſcale forms the ſyſtem of diatonick muſic, and conſiſts of diatonick intervals, it will be neceſſary, for underſtanding the former, that we ſhould explain the latter. See INTERVAL.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gum tragacanth is the chief ingredient.

DIAUGOPHRAGMIA, in natural hiſtory, a genus of foſſils of the order of ſeptariæ, whoſe partitions or ſepta, conſiſt of ſpar with an admixture of cryſtal. Of this genus there are three ſpecies. 1. A red kind, with browniſh yellow partitions. 2. A browniſh yellow kind, with whitiſh partitions. 3. A bluiſh-white kind, with ſtraw-coloured partitions.

DIBBLE, or DIBBER, a ſimple but uſeful implement in gardening, uſed for planting out all ſorts of young plants, &c.

DIBBLING WHEAT. See AGRICULTURE, n° 126—129.

DIBIO, or DIVIO (anc. geog.), the *Divionenſe Caſtrum*, and the *Divionum* of the lower age; a town of the Lingones, in Gallia Belgica: *Dibionenſes*, the people. Now *Dijon*, the capital of Burgundy. E. Long. 5. 5. N. Lat. 47. 15.

DICE, among gameſters, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of faces.

Sharpers have ſeveral ways of falſifying dice. 1. By ſticking a hog's briſtle in them, ſo as to make them run high or low as they pleaſe. 2. By drilling and loading them with quickſilver: which cheat is found out by holding them gently by two diagonal corners: for if falſe, the heavy ſides will turn always down. 3. By filing and rounding them. But all theſe ways fall far ſhort of the art of the dice-makers; ſome of whom are ſo dexterous this way, that your ſharping gameſters will give any money for them.

Dice formerly paid 5 s. every pair imported, with an additional duty of 4 s. 9$\frac{45}{100}$ d. for every 20 s. value upon oath; but are now prohibited to be imported.

DICÆARCHUS, a ſcholar of Ariſtotle, compoſed a great number of books which were much eſteemed. Cicero and his friend Pomponius Atticus valued him highly. He wrote a book to prove, that men ſuffer more miſchief from one another than from all evils beſide. And the work he compoſed concerning the republic of Lacedemon was extremely honoured, and read every year before the youth in the aſſembly of the ephori. Geography was one of his principal ſtudies, on which ſcience there is a fragment of a treatiſe of his ſtill extant, and preſerved among the *Veteris geographiæ ſcriptores minores*.

DICHOTOMOUS, in botany. See BOTANY, p. 442, n° 41.

DICHOTOMY, a term uſed by aſtronomers for that phaſis or appearance of the moon, wherein ſhe is biſected, or ſhows juſt half her diſk. In this ſituation the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature.

DICKER, in old writers, denotes the quantity of ten hides of ſkins, whereof 20 made a laſt: alſo 10 pair of gloves, ten bars of iron, and the like, are ſometimes expreſſed by the term *dicker*.

DICKINSON (Edmund), a celebrated Engliſh phyſician and chemiſt, born in 1624. He ſtudied and took his degrees at Merton-college, Oxford; and in 1655 publiſhed there his *Delphi Phœnicizantes*, &c. a moſt learned piece, in which he attempted to prove, that the Greeks borrowed the ſtory of the Pythian Apollo, and all that rendered the oracle at Delphos famous, from the Holy Scriptures, and the book of Joſhua in particular: a work that procured him great reputation both at home and abroad. He practiſed phyſic firſt at Oxford; but removing to London in 1684, his good fortune in recovering the earl of Arlington from a dangerous ſickneſs, procured his promotion to be phyſician in ordinary to Charles II. and to his houſehold. As that prince underſtood and loved chemiſtry, Dr Dickinſon grew into great favour at court; and was continued in his appointments under James. II. After the abdication of his unfortunate maſter, being then in years, and afflicted with the ſtone, he retired from practice, and died in 1707. He publiſhed many other things, particularly *Phyſica vetus & vera*, &c. containing a ſyſtem of philoſophy chiefly framed on principles collected from the Moſaic hiſtory.

DICTAMNUS, WHITE DITTANY, or *Fraxinella*: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 26th order, *Multiſiliquæ*. The calyx is pentaphyllous; the petals are five, and patulous; the filaments ſprinkled with glandulous points; the capſules five, coalited. There is only one ſpecies. It hath thick, penetrating, perennial roots, collected into a head at top, ſending up erect ſtalks annually, two or three feet high, garniſhed with pinnated alternate leaves, of three or four pair of oblong ſtiff lobes, terminated by an odd one; and the ſtalks crowned by long, pyramidal, looſe ſpikes of flowers, of white, red, and purple colours. They are very ornamental plants, and ſucceed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morea, forms an article in the materia medica. The leaves, which are the only parts uſed, are imported from Italy. The beſt ſort are well covered over with a thick white down, and now and then intermixed with purpliſh flowers. In ſmell and taſte they ſomewhat reſemble lemon-thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when freſh, they yield a conſiderable quantity of an excellent eſſential oil.

DICTATOR, a magiſtrate at Rome inveſted with regal authority. This officer was firſt choſen during the Roman wars againſt the Latins. The conſuls being unable to raiſe forces for the defence of the ſtate, becauſe the plebeians refuſed to inliſt if they were not diſcharged of all the debts they had contracted with the patricians, the ſenate found it neceſſary to elect a new magiſtrate with abſolute and uncontroulable power to take care of the ſtate. The dictator remained in office for ſix months, after which he was again elected if the affairs of the ſtate ſeemed to be deſperate; but if tranquillity was re-eſtabliſhed, he generally laid down his power before the time was expired. He knew no ſuperior in the republic, and even the laws were ſubjected to him. He was called dictator, becauſe *dictus*, named by the conſul, or *quoniam dictis ejus parebat populus*, becauſe the people implicitly obeyed his command. He was named by the conſul in the night *viva voce*, and his election was confirmed by the auguries. As his power was abſolute, he could proclaim war, levy forces, conduct them againſt an enemy, and diſband them at his pleaſure. He puniſhed as he pleaſed, and from his deciſion there lay no appeal, at leaſt till later times. He was preceded by 24 lictors with the *faſces*; during his adminiſtration, all other officers, except the tribunes of the people, were ſuſpended, and he was the maſter of the republic. But amidſt all this independence, he was not permitted to go beyond the borders of Italy, and he was always obliged to march on foot in his expeditions, and he never could ride in difficult and laborious marches without previouſly obtaining a formal leave from the people. He was choſen only when the ſtate was in imminent dangers from foreign enemies or inward ſeditions. In the time of a peſtilence a dictator was ſometimes elected, as alſo to hold the *comitia*, or to celebrate the public feſtivals, or drive a nail in the capitol, by which ſuperſtitious ceremony the Romans believed that a plague could be averted, or the progreſs of an enemy ſtopped. This office, ſo reſpectable and illuſtrious in the firſt ages of the republic, became odious by the perpetual uſurpations of Sylla and J. Cæſar; and after the death of the latter, the Roman ſenate paſſed a decree which for ever after forbad a dictator to exiſt in Rome. The dictator, as ſoon as elected, choſe a ſubordinate officer called his maſter of horſe, *magiſter equitum*. This officer was reſpectable; but he was totally ſubſervient to the will of the dictator, and could do nothing without his expreſs order. This ſubordination, however, was ſome time after removed; and during the ſecond Punic war the maſter of the horſe was inveſted with a power equal to that of the dictator. A ſecond dictator was alſo choſen for the election of magiſtrates at Rome after the battle of Cannæ. The dictatorſhip was originally confined to the patricians; but the plebeians were afterwards admitted to ſhare it. Titus Largius Flavus was the firſt dictator, in the year of Rome 253.

DICTION, the phraſe, elocution, or ſtyle, of a writer or ſpeaker. See ORATORY, n° 99—121.

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and ſciences began to be improved and extended, the multiplicity of technical terms rendered it neceſſary to compile dictionaries, either of ſcience in general, or of particular ſciences, according to the views of the compiler.

DICTIONARY of the Engliſh Language. The deſign of every dictionary of language is to explain, in the moſt accurate manner, the meaning of every word; and to ſhow the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the moſt accurate manner, is the moſt complete. Therefore the principal ſtudy of a lexicographer ought to be, to diſcover a method which will be beſt adapted for that purpoſe. Dr Johnſon, with great labour, has collected the various meanings of every word, and quoted the authorities: but, would it not have been an improvement if he had given an accurate definition of the preciſe meaning of every word; pointed out the way in which it ought to be employed with the greateſt propriety; ſhowed the various deviations from that original meaning, which cuſtom had ſo far eſtabliſhed as to render allowable; and fixed the preciſe limits beyond which it could not be employed without becoming a vicious expreſſion? With this view, it would have been neceſſary to exhibit the nice diſtinctions that take place between words which are nearly ſynonymous. Without this, many words can only be defined in ſuch a manner, as that they muſt be conſidered as exactly ſynonymous. We omit giving any quotations from Johnſon, to point out theſe defects; and ſhall content ourſelves with giving a few examples, to ſhow how, according to our idea, a dictionary of the Engliſh language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Inſtantly, without delay. Always employed to denote future time, and never paſt. Thus, we may ſay, *I will come immediately;* but not, *I am immediately come from ſuch a place.* See PRESENTLY.
2. Without the intervention of any cauſe or event; as oppoſed to *mediately.*

PRESENTLY. *adv. of time.*

1. Inſtantly, without delay. Exactly ſynonymous with *immediately;* being never with propriety employed to denote any thing but future time.
2. Formerly it was employed to expreſs preſent time. Thus, *The houſe preſently poſſeſſed by ſuch a one,* was often uſed: but this is now become a vicious expreſſion; and we ought to ſay, *The houſe poſſeſſed at preſent.* It differs from *immediately* in this, that even in the moſt corrupt phraſes it never can denote paſt time.

FORM. *ſubſt.* The external appearance of any object, when conſidered only with reſpect to ſhape or figure. This term therefore, in the literal ſenſe, can only be applied to the objects of the ſight and touch; and is nearly ſynonymous with *figure:* but they differ in ſome reſpects. *Form* may be employed to denote more rude and unfiniſhed ſhapes; *figure,* thoſe which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abſtract: thus, we ſay a ſquare or a triangular *figure;* but not a ſquare or triangular *form.* And in the ſame manner we ſay, the *figure* of a houſe; but we muſt denote the ſubſtance which forms that figure, if we uſe the word *form;* as, *a cloud of the form of a houſe,* &c. See FIGURE.

2. In contraſt to irregularity or confuſion. As beauty cannot exiſt without order, it is by a figure of ſpeech employed to denote beauty, order, &c.
3. As *form* reſpects only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of ſpeech, employed in contraſt to theſe qualities, to denote empty ſhow, without eſſential qualities. In this ſenſe it is often taken when applied to religious ceremonies, &c.
4. As *form* is employed to denote the external appearance of bodies; ſo, in a figurative ſenſe, it is applied to reaſoning, denoting the particular mode or manner in which this is conducted; as, *the form of a ſyllogiſm,* &c.
5. In the ſame manner it is employed to denote the particular mode of procedure eſtabliſhed in courts of law; as, *the forms of law, religion,* &c.
6. *Form* is ſometimes, although improperly, uſed to denote the different circumſtances of the ſame body; as, *water in a fluid or a ſolid form.* But as this phraſe regards the internal qualities rather than the external figure, it is improper; and ought to be, *water in a fluid or a ſolid ſtate.*
7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumſtances than ſhape or figure: for we may ſay, *a juice exſuding from a tree in the form of wax or reſin;* although, in this caſe, the conſiſtence, colour, &c. and not the external arrangement of parts, conſtitutes the reſemblance.
8. From the regular appearance of a number of perſons arranged in one long ſeat, ſuch perſons ſo arranged are ſometimes called a *form;* as, *a form of ſtudents,* &c. And,
9. By an eaſy tranſition, the ſeat itſelf has alſo acquired that name.

GREAT. *adj.* A relative word, denoting largeneſs of quantity, number, &c. ſerving to augment the value of thoſe terms with which it is combined, and oppoſed to *ſmall* or *little.* The principal circumſtances in which this word can be employed are the following:

1. When merely *in*animate objects are conſidered with regard to quantity, *great* is with propriety employed, to denote that the quantity is conſiderable; as, *a great mountain, a great houſe,* &c. and it is here contraſted with *ſmall.* When *great* is thus employed, we have no other word that is exactly ſynonymous.
2. When *in*animate objects are conſidered with regard to their extent, this term is ſometimes employed, although with leſs propriety; as, *a great plain, a great field,* &c. And in this ſenſe it is nearly ſynonymous with *large;* and they are often uſed indiſcriminately, but with ſome difference of meaning: for, as *large* is a term chiefly employed to denote extent of ſuperficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely ſuperficial, it denotes that it is the extent of ſurface that is there meant to be conſidered, without regard to the other dimenſions: whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we ſay, *a large houſe,* or *a large river,* we expreſs that the houſe, the river, have a ſurface of great extent, without having any neceſſary connection with the ſize in other reſpects. But if we ſay, *a great houſe,* or *a great river,* it at once denotes that they have not only a large ſurface, but are alſo of great ſize in every reſpect.
3. *Great,* when applied to the human ſpecies, never denotes the ſize or largeneſs of body, but is applied ſolely to the qualities of the mind. Thus,

when we ſay, that *Socrates was a great man*, we do not mean that he was a man of great ſize, but that he was a man who excelled in the endowments of the mind. The terms which denote largeneſs of ſize in the human body are, *big*, *bulky*, *huge*, &c.

4. *Great* is ſometimes applied to the human ſpecies, as denoting high rank. In this caſe it is oftener uſed in the plural number than otherwiſe. Thus we ſay ſimply, *the great*, meaning the whole body of men in high ſtation, as oppoſed to *mean*. It ſhould ſeldom be employed in this ſenſe, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity*, *quality*, *number*, *excellence*, or *defects*; or ſuch as imply *praiſe*, *blame*, *anger*, *contempt*, or any other affection of the mind.

6. It is employed to denote every ſtep of aſcending or deſcending conſanguinity; as, *great-grandfather*, *great-grandſon*, &c.

HIGH. *adj.* Exalted in a perpendicular direction at a diſtance from the ſurface of the earth. Oppoſed to *low*.

1. *High* is a term altogether indefinite, and is employed to expreſs the degree of elevation of any inanimate body. Thus we ſay, *a high mountain*, *a high houſe*, *ſteeple*, *tower*, *pillar*, &c. Nor is there any other word that can here be conſidered as ſynonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To expreſs the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this caſe nearly ſynonymous. We may therefore ſay, a *high* or *tall tree*, a *high* or *tall maſt*, &c. but with this difference between theſe two expreſſions, that *tall* can be more properly applied to thoſe that are much elevated and of ſmall dimenſions; and *high*, to ſuch as are more bulky, and of greater ſize.

3. The perpendicular height of man can never be expreſſed by the word *high*; *tall* being here the proper expreſſion. And altho' *high* is ſometimes uſed to expreſs the height of other animals, yet it ſeems to be an improper expreſſion. See Tall.

4. *High*, when applied to the human ſpecies, always refers to the mind; and denotes *haughtineſs*, *ſtatelineſs*, *pride*, &c. and, when combined with the expreſſions of any energy of the mind, it denotes that in a higher degree. In this ſenſe, it is oppoſed to *meanneſs*, *abjectneſs*, and *humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almoſt every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical ſenſe uſed to denote any thing that ſeems to be above the ordinary condition of mankind; or thoſe qualities or endowments of mind that are not eaſily acquired: as, *dignity* or *elevation of ſentiment*; *dignity of rank*; *acuteneſs in reaſoning on difficult ſubjects*; *pride*, *haughtineſs*, or any other quality which ſeems beyond the ordinary level of mankind; *dearneſs of price*, &c.

6. In the ſame manner we apply this term to time; which having a metaphorical-reſemblance to a river flowing on with an unceaſing current through all ſucceſſive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewiſe thoſe degrees of latitudes far removed from the line, where the pole becomes more elevated.

8. And to ſome particular crimes, as being attended with peculiar degrees of guilt; as, *high treaſon*.

TALL. *adj.* Something elevated to a conſiderable degree in a perpendicular direction. Oppoſed to *low*.

1. This term is chiefly employed to expreſs the height of man and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be ſubſtituted in its ſtead: when applied to other animals, *high* is ſometimes conſidered as nearly ſynonymous. See High.

2. It is likewiſe employed to denote the perpendicular height of vegetables; and in this caſe, it is nearly ſynonymous with *high*. See High.

3. It can in no caſe be employed to expreſs the height of merely inanimate objects; as we can never ſay a *tall ſteeple*, *tower*, or *pillar*, but a *high ſteeple*, &c. For the diſtinctions in theſe caſes, ſee High.

LONG. *adj.* A relative term, denoting the diſtance between the extremes of any body, which is extended more in one of its geometrical dimenſions than another. Oppoſed to *ſhort*.

1. This term may be applied to all inanimate objects, of watever kind, whoſe dimenſions in one way exceeds the other, and when not in an erect poſture, whatever be the other circumſtances attending them; whether it relates to ſuperficies alone, or to ſolid bodies; whether theſe be bounded or open, ſtraight or crooked, flexible or rigid, or in any other circumſtances whatever: thus we ſay, *a long* or *ſhort line*, *a long* or *ſhort ridge*, *ſtreet*, *ditch*, *rope*, *chain*, *ſtaff*, &c. But it is to be obſerved, that although *long* is in the ſtrict ſenſe only oppoſed to *ſhort*; yet as it expreſſes the extenſion of matter in one of its geometrical proportions, it is often contraſted by thoſe words which expreſs the other proportions when we mean only to deſcribe the ſeveral proportions: as, *a table long and broad*. And as theſe ſeveral dimenſions are expreſſed by different words, according to the various forms, modifications, and circumſtances, in which bodies are found, therefore it is in this ſenſe contraſted by a great diverſity of terms: as, *a long and broad* or *wide*, *narrow* or *ſtrait*, *ſtreet* or *lane*; *a long and thick*, or *ſmall*, *rope*, *chain*, *ſtaff*. For the diſtinctions in theſe caſes, ſee Broad, Wide, &c.

2. Objects neceſſarily fixed in an erect poſition can never have this term applied to them; and therefore we cannot ſay *a long*, but *a high*, *tower* or *ſteeple*. And for the ſame reaſon, while trees are growing and fixed in an erect poſition, we cannot apply this term to them; but when they are fell-

ed and laid upon the ground, it is quite proper and neceſſary. Thus, we do not ſay *a long*, but *a tall* or *high tree*, while it is growing; but we ſay *a long*, not *a tall log of wood*: and in the ſame manner we ſay *a tall maſt*, when it is fixed in the ſhip; but *a long maſt*, while it lies upon the beach. See TALL and HIGH.

3. Thoſe vegetables which are of a tender pliant nature, or ſo weak as not to be able to retain a fixt poſition, being conſidered as of a middle nature between erect and proſtrate bodies, admit of either of the terms *long*, *tall*, or *high*; as, *a long* or *tall ruſh* or *willow wand*, or *a long*, *tall*, or *high ſtalk of corn*. See HIGH and TALL.

4. The parts of vegetables, when conſidered as diſtinct from the whole, even when growing and erect, aſſume the term *long*: for we do not ſay *a tall*, but *a long ſhoot of a tree*; and *a tree with a long ſtem*, in preference to *a tree with a high ſtem*.

5. For the ſame reaſon, a ſtaff, and pole, even when fixed in a perpendicular direction, aſſume the word *long*, in preference to *tall* or *high*.

6. With regard to animals, the general rule is applied, without any exceptions: *tall*, and not *long*, being employed to denote the height of the human body, when in an erect poſture; and *long*, and not *tall*, to denote its length when in an incumbent ſituation. *Long*, applied to all other animals which do not walk erect, always denotes their greateſt length in a horizontal poſition from head to tail.

7. In a figurative ſenſe, it denotes, with regard to time, any thing at a great diſtance from us.

8. As alſo, any thing that takes up much time before it is finiſhed; as, *a long diſcourſe*, *a protracted note in muſic*, &c.

BROAD, *adj.* The diſtance between the two neareſt ſides of any body, whoſe geometrical dimenſions are larger in one direction than in another; and has a reference to ſuperficies only, and never to the ſolid contents. Oppoſed to *narrow*.

1. *Broad*, in the ſtricteſt acceptation, is applied to denote thoſe bodies only whoſe ſides are altogether open and unconfined; as, *a broad table*, *a broad wheel*, &c.: and in theſe caſes it is invariably contraſted by the word *narrow*; nor is there any other word which in theſe caſes can be conſidered as ſynonymous with it, or uſed in its ſtead.

2. When any object is in ſome ſort bounded on the ſides, although not quite cloſed up, as a road, ſtreet, ditch, &c. either *broad* or *wide* may be employed, but with ſome difference of ſignification; *broad* being moſt properly uſed for thoſe that are more open, and *wide* for thoſe which are more confined: nor can this term be ever applied to ſuch objects as are cloſe bounded all around, as a houſe, a church, &c. *wide* being here employed. For the more accurate diſtinctions in theſe caſes, ſee the article WIDE.

WIDE. *adj.* A term employed to denote relative extent in certain circumſtances. Oppoſed to *narrow* and *ſtrait*.

1. This term is in its proper ſenſe applied only to denote the ſpace contained within any body cloſed all round on every ſide; as a houſe, gate, &c.: and differs from *broad* in this, that it never relates to the ſuperficies of ſolid objects, but is employed to expreſs the capaciouſneſs of any body which containeth vacant ſpace; nor can capaciouſneſs in this ſenſe be expreſſed by any other word but *wide*.

2. As many bodies may be conſidered either with reſpect to their capaciouſneſs or ſuperficial extent; in all theſe caſes, either the term *broad* or *wide* may be uſed; as, *a broad* or *wide ſtreet* or *ditch*, &c. but with a greater or leſs degree of propriety, according to the circumſtances of the object, or the idea we wiſh to convey. In a ſtreet where the houſes are low and the boundaries open, or in a ditch of ſmall depth and large ſuperficies, as this largeneſs of ſuperficies bears the principal proportion, *broad* would be more proper: but if the houſes are of great height, or the ditch of great depth, and capaciouſneſs is the principal property that affects the mind, we would naturally ſay *a wide ſtreet* or *ditch*; and the ſame may be ſaid of all ſimilar caſes. But there are ſome caſes in which both theſe terms are applied, with a greater difference of meaning; thus we ſay *a broad* or *a wide gate*: But as the gate is employed to denote either the aperture in the wall, or the matter which cloſes that aperture, theſe terms are each of them uſed to denote that particular quality to which they are generally applied: and as the opening itſelf can never be conſidered as a ſuperficies, the term *wide*, in this caſe, denotes the diſtance between the ſides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to cloſe that aperture; nor can theſe two terms in any caſe be ſubſtituted for one another.

3. As a figurative expreſſion, it is uſed as a cant phraſe for a miſtake: as, *you are wide of the mark*; that is, not near the truth.

NARROW. *adj.* A relative term, denoting a proportional ſmallneſs of diſtance between the ſides of the ſuperficies of plain bodies. Oppoſed to *broad*.

1. As this is only applied to ſuperficies, it is exactly contraſted by *broad*, and is applied in all caſes where the term *broad* can be uſed, (ſee BROAD); and in no other caſe but as a contraſt to it, except the following.

2. It ſometimes is employed to deſcribe the ſmallneſs of ſpace circumſcribed between certain boundaries, as oppoſed to *wide*, and nearly ſynonymous with *ſtrait*; as we ſay *a wide* or *a narrow houſe*, *church*, &c. For the neceſſary diſtinctions here, ſee the article STRAIT.

3. In a figurative ſenſe it denotes *parſimony*, *poverty*, *confined ſentiments*, &c.

STRAIT, *adj.* A relative term, denoting the extent of ſpace in certain circumſtances. Oppoſed to *wide*; ſee WIDE.

1. This term is employed, in its proper ſenſe, to denote only ſpace, as contained between ſurrounding bodies in ſuch circumſtances as to denote ſome degree of confinement; and is exactly oppoſed to *wide*: as, *a wide* or *a ſtrait gate*, &c. See WIDE.

2. So neceſſary is it that the idea of confinement

ſhould be connected with this word, that in all thoſe caſes where the ſpace contained is large, as in a church or houſe, we cannot expreſs a ſmaller proportional width by this term. And as we have no other word to expreſs ſpace in theſe circumſtances, we have been obliged to force the word *narrow* from its natural ſignification, and make it expreſs this. See Narrow.

3. In ſome particular caſes, *narrow* or *ſtrait* may be employed to the ſame object; as, *a narrow* or *a ſtrait line:* but here *ſtrait* is never employed but where an idea of confinement is ſuggeſted, and where it is exactly contraſted to *wide;* nor can *narrow* be employed but in ſuch circumſtances where *broad* would be a perfect contraſt to it. Therefore theſe two terms may be always employed in the ſame circumſtances as thoſe which contraſt them may be. For an account of which, ſee Wide.

3. The term *ſtrait* is likewiſe in a peculiar manner uſed to denote the ſmallneſs of the internal diameter of thoſe ſmall bodies which are fitted to receive or contain others, as any kind of bag, tube, body-clothes, mortoiſes, and others of the ſame kind; and in all theſe caſes this term may be employed to denote the ſmallneſs of their leſſer diameter, and never the term *narrow*. But in certain circumſtances the word *tight* may be ſubſtituted for it. See Tight.

4. *Strait*, in a figurative ſenſe, denotes any ſort of confinement of ſentiment or diſpoſition.

TIGHT. *adj.* A term employed in certain circumſtances to denote the internal capacity of particular bodies. Nearly ſynonymous with *ſtrait*.

This term is confined entirely to denote the ſmallneſs of the internal dimenſions of ſuch objects as are formed to cover or to receive or contain other ſolid bodies, and can be employed in no other caſe. And although it agrees with *ſtrait*, in always denoting confinement, and by being applicable to the ſame ſpecies of objects, yet it differs in the following reſpects: 1. If there be any difference of the diameter of the objects to which the term *ſtrait* can be applied, it always has reference to the ſmaller; yet *tight* may be applied to any ſort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of ſmall diameter, without any ſort of reference to the nature of the ſubſtance which it may be capable of containing. For we can ſay *a ſtrait bag, a ſtrait ſleeve, a ſtrait mortoiſe, a ſtrait gate,* &c. whereas *tight* can only be applied to any body when it is conſidered as having reference to another body which is intended to be contained in it, and is pinched for want of room. Thus we ſay, *the ſleeve of a coat is too tight for the arm, the mortoiſe is too tight for the tenon,* &c.; but we cannot ſay, *the bag, or the gate, is too tight,* becauſe theſe are fitted to receive any ſort of objects. And hence it happens, that, in many caſes, the dimenſions of the ſame body may be expreſſed by *tight* or *ſtrait* when conſidered in different circumſtances. Thus we may ſay, *this ſleeve is too ſtrait,* when we look at a coat when lying on the table, and conſider its proportions; but it is not till we have tried it upon the arm that it is intended to cover, that we call it *tight*. And we may ſay, *a gate is too ſtrait,* or *too tight:* but in the firſt caſe we conſider it as being too confined for admitting objects to paſs through it; and in the laſt, as being too confined with reſpect to the leaves that are to ſhut the aperture, not allowing them ſpace to move with freedom.

Theſe examples may ſerve to give ſome idea of the plan of an Engliſh Dictionary compoſed upon philoſophical principles: But, beſides the circumſtances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the Engliſh language, a great variety of terms occur, which denote matter under certain general forms or circumſtances, without regarding the minute diverſities that may take place; as the word *cloth*, which denotes matter as manufactured into a particular form, including under it all the variety of ſtuffs manufactured in that particular way, of whatever materials, colours, texture, or fineneſs, they may be. The ſame may be ſaid of *wood*, *iron*, *yarn*, and a great variety of terms of the ſame nature, ſome of which cannot aſſume any plural; while others admit of it in all caſes, and others admit or refuſe it according to the different circumſtances in which they are conſidered. In a dictionary, therefore, all this variety of caſes ought to be clearly and diſtinctly pointed out under each particular article: this is the more neceſſary, as ſome of theſe words have others formed from them, which might be readily miſtaken for their plurals, altho' they have a very different ſignification; as *cloaths*, which does not denote any number of pieces or different kinds of *cloth*, but *wearing apparel*. The following example will illuſtrate this head.

WOOD. *ſub.* A ſolid ſubſtance, of which the trunks and branches of trees conſiſt.

1. This term is employed to denote the ſolid parts of vegetables of all kinds, in whatever form or circumſtances they are found. Nor does this term admit of plural with propriety, unleſs in the circumſtances after-mentioned: for we ſay, *many different kinds of wood*, in preference to *many kinds of woods;* or, we ſay, *oak*, *aſh*, or *elm wood*, not *woods*.

2. But where we want to contraſt *wood* of one quality or country with that of another, it admits of a plural: for we ſay, *white woods are in general ſofter than red;* or *Weſt-Indian woods are in general of greater ſpecific gravity than the European woods:* But unleſs where the colour, or ſome quality which diſtinguiſhes it from growing wood, is mentioned, this plural ought as much as poſſible to be avoided, as it always ſuggeſts an idea of growing wood.

3. *Wood* likewiſe denotes a number of trees growing near one another; being nearly ſynonymous with *foreſt:* See Forest. In this ſenſe it always admits of a plural; as, *Ye woods and wilds whoſe ſolitary gloom*, &c.

A dictionary cannot be reckoned complete without explaining obſolete words; and if the terms of the ſeveral provincial dialects were likewiſe given, it would be of great utility: nor would this take much time; becauſe a number of theſe words needs no other explanation than to mark along with them the words which had come in their place, when there happened to be one perfectly ſynonymous: and in thoſe caſes where the ſame idea could not be expreſſed in modern language without a periphraſis, it would be of uſe to explain them diſtinctly; ſo that, when a writer found himſelf at a loſs for a term, and obliged to ſearch for one beyond the bounds of our own language, he might take one of theſe, when he found that it was expreſſive and energetic, in preference to another drawn from a foreign language. This would at leaſt have one good effect: it would make our language more fixed and ſtable; not to ſay more accurate and preciſe, than by borrowing from foreign languages. The following examples may ſerve to give ſome idea of the manner of treating this part of the work.

MOE, or MO. *adj.* An obſolete term ſtill employed in the Scotch dialect, and by them pronounced *mae;* denoting a greater number, and nearly ſynonymous with *more:* but it differs in this reſpect, that in the Scotch dialect, *mae* and *mair* (Engliſh *more*) are each employed in their diſtinct ſphere, without encroaching upon one another; *mae* being employed to denote number, but never quantity or quality; and *mair*, to denote quantity and quality, but never number: thus they ſay *mae*, not *mair*, *apples*, *men*, &c, and they ſay *mair*, not *mae*, *cloth*, *earth*, *courage*, &c. See MAIR. Both of theſe terms are ſupplied by the word *more;* which in the Engliſh language is applied indiſcriminately to denote quantity, quality, and number. See MORE.

THIR. *pron.* Obſolete; ſtill employed in the Scotch dialect: the plural of *this;* and contraſted to *theſe*, in the ſame manner as *that* is to *this*.

As there is no word in the Engliſh language equivalent to this, we thus ſhow the manner in which it is employed. In the Engliſh language we ſay, *that ſtone* or *houſe*, pointing at one at a diſtance, *is larger or more commodious than this ſtone* or *this houſe*, which is ſuppoſed to be at hand. In the ſame manner, in the Scotch dialect, they ſay, *theſe* (or, as it is pronounced, *thae*) *ſtones are whiter than thir ſtones;* denoting, that the former are at a diſtance, and the latter at hand. And, in the ſame manner, it is invariably applied to denote any preſent object in the plural number, as oppoſed to *theſe:* as *theſe* or *thir apples*, as at hand, or at a diſtance; *theſe*, or *thir trees*, &c; but never in the ſingular number, as it is always *this* or *that tree*, *houſe*, &c.

As the Engliſh language is ſo exceedingly irregular in the pronunciation, the ſame letter in the ſame ſituation often aſſuming ſounds totally different in different words, it is impoſſible to eſtabliſh any general rules on this ſubject, which do not admit of many exceptions: therefore, a dictionary is the beſt means of aſcertaining and pointing out the proper pronunciation of words. For, if the writer firſt pointed out all the different ſounds that the ſame letter could ever be made to expreſs, and aſſigned to every particular ſound which each letter could be made to aſſume, a particular mark, which was appropriated to denote that particular ſound of the letter whenever it occurred; by placing theſe particular marks above the letters in the dictionary, the ſound of each letter would be pointed out in all caſes with the utmoſt certainty. It would be impoſſible for us to illuſtrate this by examples, without firſt aſcertaining all the ſounds of each letter; which would lead us into a diſcuſſion too long for this place.

We ſhall only further obſerve, that, beſides having the accented ſyllable of every word *properly* diſtinguiſhed in a dictionary to aſſiſt in the pronunciation, the Engliſh language requires another eſſential improvement, *viz.* the uſe of accents to diſtinguiſh the meaning of *words* and *phraſes:* which, although it is not ſo properly confined to a lexicographer, yet it is not quite without his ſphere. Thus the word *as* admits of two very different ſounds, as well as different ſignifications; as in this example, "Cicero was nearly *as* eloquent *as* Demoſthenes:" in which the firſt *as* is pronounced *aſs*, and the laſt is pronounced *az*. Now, it often happens, that, in reading, the particular way in which it ought to be underſtood is not pointed out by the context, till after the word itſelf is pronounced, which has an equal chance at leaſt of being pronounced wrong; whereas, if it were always accented when employed in the one ſenſe, and not in the other, it would free the reader from this perplexity. There are other caſes in which the uſe of proper accents in writing would be of great conſequence; as at the beginning of a ſentence, when it was put as a queſtion, or uſed ironically, &c. the want of which every one muſt have obſerved. But as this does not ſo properly belong to the lexicographer as the grammarian, we ſhall here take no further notice of it.

The above examples, we hope, will be ſufficient to give the reader ſome idea of the plan that we would propoſe; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the Engliſh language, than thoſe dictionaries that have been hitherto publiſhed. Theſe examples were given rather with a view to ſhow the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the ſeveral articles there enumerated; and therefore we did not think it neceſſary to produce any authorities, although we are ſenſible that they would be requiſite in ſuch a work.

DICTYMNIA, or DICTYNNIA, in mythology, were feaſts celebrated at Lacedæmon and in Crete, in honour of Diana Dictymnia or Dictynnia, or of a nymph taken for her, who, having plunged herſelf into the ſea, to eſcape the paſſion of Minos, was caught in a fiſherman's net or δικτυον, whence the name.

DICTYS (Cretenſis), a very ancient hiſtorian, who ſerving under Idomeneus king of Crete in the Trojan war, wrote the hiſtory of that expedition in nine books; and Tzetzes tells us, that Homer formed his Iliad upon the plan of that hiſtory. It is however maintained, that the Latin hiſtory of Dictys which we have at preſent is ſpurious.

DIDACTIC, in the ſchools, ſignifies the manner of ſpeaking or writing, adapted to teach or explain the nature of things.—The word is formed from the Greek διδασκω, *doceo*, "I teach."

There are many words that are only uſed in the didactic and dogmatic way: and there are many works, ancient and modern, both in proſe and verſe, written after this method: ſuch are the Georgics of Virgil, Lucretius's poem De Rerum Natura, and Pope's Eſſays on Criticiſm and on Man, &c. &c.

DIDAPPER, in ornithology. See COLYMBUS.

Plate CLV. (in Vol. V.)

DIDELPHIS, or OPOSSUM, in zoology; a genus of quadrupeds belonging to the order of *feræ*, the characters of which are theſe: They have ten fore-teeth in the upper jaw, and eight in the under one. The dog-teeth are long; the tongue is ſomewhat ciliated; and they have a pocket formed by a duplicature of the ſkin of the belly, in which the dugs are included.

1. The marſupialis, or Virginian opoſſum, has a long ſharp-pointed noſe; large, round, naked, and very thin ears; ſmall, black, lively, eyes; long ſtiff hairs on each ſide the noſe, and behind the eyes: the hind part of the neck and back covered with hair two inches long; the bottoms of a yellowiſh white, middle part black, ends whitiſh: the ſides covered with hair of a dirty and duſky colour; the belly with ſoft, woolly, dirty white hair: the tail, for near three inches, clothed with long hairs like thoſe on the back; the reſt of the tail covered with ſmall ſcales. The tail of this animal has a diſagreeable appearance, looking like the body of a ſnake, and has the ſame prehenſile quality with that of ſome monkeys; the body is round and pretty thick, the legs ſhort: on the lower part of the belly of the female is a large pouch, in which the teats are lodged, and where the young ſhelter as ſoon as they are born. The length of the body is 16 or 17 inches; that of the tail 14.—This creature inhabits many parts of America and the Eaſt Indies. It is very deſtructive to poultry, and ſucks the blood without eating the fleſh; it feeds alſo on roots and wild fruits, and is very active in climbing trees. It hunts eagerly after birds and their neſts; and will hang ſuſpended from the branches of a tree by its tail; then, by ſwinging its body, it will fling itſelf among the trees that grow in the neighbourhood. It walks very ſlow; and when purſued and overtaken will feign itſelf dead. It is not eaſily killed, being as tenacious of life as a cat. When the female is about to bring forth, ſhe makes a thick neſt of dry graſs in ſome cloſe buſh at the foot of a tree; and brings four, five, or ſix, young at a time. As ſoon as the young are brought forth, they take ſhelter in the pouch or falſe belly; and faſten ſo cloſely to the teats, that they cannot be ſeparated without difficulty. They are blind, naked, and very ſmall, when new-born, and reſemble fœtuſes: it is therefore neceſſary that they ſhould continue in that falſe belly till they attain proper ſtrength and ſight; and are prepared to undergo what may be called a *ſecond birth*. After this they run into the pouch as into an aſylum in time of danger; and the parent carries them about with her. During the time of this ſecond geſtation, the female ſhows an exceſſive attachment to her young, and will ſuffer any torture rather than allow this receptacle to be opened; for ſhe has the power of opening or cloſing it by the aſſiſtance of ſome very ſtrong muſcles. The fleſh of the old animal is very good, like that of a ſucking pig: the hair is dyed by the Indian women, and wove into garters and girdles: the ſkin is very fetid.

2. The Molucca opoſſum has long, oval, and naked ears: the mouth is very wide: the lower ſide of the upper jaw, throat, and belly, is of a whitiſh aſh colour; reſt of the hair a cinereous brown tipt with tawny, darkeſt on the back: the tail is as long as the body; near the baſe covered with hair, the reſt naked: the claws are hooked. On the belly of the female is a pouch, in which the young (like thoſe of the former) ſhelter. Marcgrave found ſix young within the pouch. It has ten cutting teeth above and eight below. The length of the animal from noſe to tail is ten inches; and the tail exceeds the length of head and body. Its whole figure is of a much more ſlender and elegant make than the former. The tail pulveriſed, and taken in a glaſs of water, is reckoned in New Spain a ſovereign remedy againſt the gravel, colic, and ſeveral other diſorders. This ſpecies is found in great numbers in Aroe and Solor: It is called in the Indies *pelandor aroe*, or the *aroe rabbet*. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the ſame places in which they keep their rabbets. It inhabits alſo Surinam, and the hot parts of America.

3. The murina, or murine opoſſum, hath the face and upper parts of the body of a tawny colour; the belly of a yellowiſh white: the tail is ſlender, and covered with minute ſcales to the very rump: the length of the animal from noſe to tail, about ſix inches and a half; the tail of the ſame length: the female wants the falſe belly of the former; but on the lower part the ſkin forms on each ſide a fold, between which the teats are lodged. It inhabits the hot parts of South America; agrees with the others in its food, manners, and the prehenſile power of its tail. It brings from 10 to 14 young ones at a time: they affix themſelves to the teats as ſoon as they are born, and remain attached like inanimate things, till they attain growth and vigour to ſhift a little for themſelves.

4. The Mexican opoſſum, is of an aſh-colour on the head and upper parts of the body: the belly and legs are whitiſh: the tail is long and pretty thick, varied with brown and yellow; it is hairy near an inch from its origin, the reſt naked: the length of the animal from noſe to tail, about ſeven inches and a half; of the tail, more than 11.—It inhabits the mountains of Mexico, and lives in trees, where it brings forth its young: when in any fright, they embrace the parent cloſely. The tail is prehenſile, and ſerves inſtead of a hand.

5. The phalanger, or Surinam opoſſum of Buffon, has the upper part of the body reddiſh, mixed with a light aſh-colour and yellow: the under parts are of a dirty yellowiſh white; the bottom of the tail is covered with hair, for near two inches and a half; the reſt naked: the length of the animal from noſe to tail is near nine inches; the tail ten. It inhabits Surinam, according to Buffon; who ſuppoſes it may be the ſpecies called by the coloniſts the *cane rat*, which is ſo deſtructive to the ſugar-canes. According to Dr Pallas, it inhabits the Eaſt India iſlands, but is not found in Surinam.

6. The dorſigera, or merian opoſſum, hath the head and upper part of the body of a yellowiſh brown colour; the belly white, and tinged with yellow; the

tail very long and ſlender, and, except at the baſe, quite naked.—It is a native of Surinam, and burrows under ground: it brings five or ſix young at a time, which follow their parent: on any apprehenſion of danger, they all jump on her back; and twiſting their tails round her's, ſhe immediately runs with them into her hole.

7. The kanguroo. This animal has a ſmall head, neck, and ſhoulders; the body increaſing in thickneſs to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the noſe; end of the noſe naked and black; the upper lip divided. The noſtrils are wide and open; the lower jaw is ſhorter than the upper; and the aperture of the mouth ſmall: there are whiſkers on both jaws, thoſe on the upper longeſt; and ſtrong hairs above and below the eyes. The eyes are not large; the irides are duſky; the pupil is of a bluiſh black. The ears are erect, oblongly ovated, rounded at the ends, and thin, covered with ſhort hairs; four inches long. There are no canine teeth; but ſix broad cutting teeth in the upper jaw; two long lanceolated teeth in the lower, pointing forward; and four grinding teeth in each jaw, remote from the others. The belly is convex and great. The fore legs are very ſhort, ſcarcely reaching to the noſe; and uſeleſs for walking. The hind legs are almoſt as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and ſtrong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an oſtrich; the two others are placed very diſtinct from it, and are ſmall: the claws are ſhort, thick, and blunt: the bottom of the feet, and hind part, black, naked, and tuberculated, as the animal reſts often on them. The tail is very long, extending as far as the ears; thick at the baſe, tapering to a point. The ſcrotum is large and pendulous. The hair on the whole animal is ſoft, and of an aſh-colour; lighteſt on the lower parts. The dimenſions of a full grown animal are not yet known. The following are thoſe of a male lately ſent to Lord Sidney by Governor Phillip.

	f.	in.
Length from the point of the noſe to the end of the tail,	8	5
Length of the tail,	3	1
——— head,	0	11
——— fore legs,	2	0
——— hind legs,	3	7
Circumference of the fore part by the legs,	1	9
——— lower parts	4	5
Round the thicker part of the tail, which gradually tapers to the end.	1	1

The above is the largeſt kanguroo that has yet been ſeen, and we are told there is every reaſon to believe that even this had not nearly attained its full growth.

It inhabits the weſtern ſide of New Holland, and has as yet been diſcovered in no other part of the world. It lurks among the graſs; and feeds on vegetables: it goes entirely on its hind legs; making uſe of the fore feet only for digging, or bringing its food to its mouth. The dung is like that of a deer. It is very timid: at the ſight of men it flies from them by amazing leaps, ſpringing over buſhes ſeven or eight feet high; and going progreſſively from rock to rock. It carries its tail quite at right angles with its body when it is in motion; and when it alights, often looks back.

In the account lately publiſhed of Governor Phillip's Voyage, we are told that theſe animals have been ſeen feeding in herds of about 30 or 40; and that one is always obſerved to be apparently on the watch at a diſtance from the reſt.—The largeſt kanguroo which has yet been ſhot, we are there told, weighed about 140 pounds. But it has been diſcovered that there are two kinds, one of which ſeldom exceeds 60 pounds in weight: theſe live chiefly on the high grounds: their hair is of a reddiſh caſt, and the head is ſhorter than the larger ſort. Young kanguroos which have been taken, have in a few days grown very tame, but none have lived more than two or three weeks. Yet it is ſtill poſſible that when their proper food ſhall be better known, they may be domeſticated. Near ſome water was found the dung of an animal that fed on graſs, which, it was ſuppoſed, could not have been leſs than a horſe. A kanguroo, ſo much above the uſual ſize, would have been an extraordinary phænomenon, though no larger animal has yet been ſeen, and the limits of growth in that ſpecies are not aſcertained. The tail of the kanguroo, which is very large, is found to be uſed as a weapon of offence, and has given ſuch ſevere blows to dogs as to oblige them to deſiſt from purſuit. Its fleſh is coarſe and lean, nor would it probably be uſed for food, where there was not a ſcarcity of freſh proviſions.

Mr Pennant obſerves, that this is a very anomalous animal; but ranks it under this genus as having more relation to it than to any other. In the account of of Phillip's Voyage, however, we are informed, that the pouch of the female, hitherto eſteemed peculiar to the opoſſum genus, has been found both in the rat and the ſquirrel kind in New Holland.

8. The quoll, or ſpotted opoſſum, is deſcribed as in length from the noſe to the beginning of the tail about 15 inches, and the tail about nine or ten. The general colour black, inclining to brown beneath; the neck and body, ſpotted with irregular roundiſh patches of white; the ears pretty large and erect; the viſage pointed, the muzzle furniſhed with long ſlender hairs; the legs, from the knees downward, almoſt naked, and aſh-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the ſame length as thoſe on the body, from thence to the end with long ones not unlike that of a ſquirrel. The female has ſix teats placed in a circle within the pouch.

9. The kanguroo rat is deſcribed as ſimilar, both in the general ſhape of the body and the conformation of the legs, to the kanguroo; but the viſage having a ſtrong reſemblance to that of the rat, and the colour of the whole not ill reſembling that animal, it has obtained the name of the *kanguroo rat*. It is an inhabitant of New Holland; and two of the ſpecies are now to be ſeen alive at the curious exhibition of animals over Exeter Exchange; where one of them, being a female, has brought forth young. This ſpecies has two cutting teeth in front of the upper jaw, with three others on each ſide of them; and at a diſtance

one falſe grinder, ſharp at the edge, and channelled or fluted on the ſides; and cloſe to theſe, two true grinders: in the lower jaw there are two long cutting teeth formed like thoſe of the ſquirrel, with three grinders correſponding with thoſe in the upper jaw.

10. The flying opoſſum, a beautiful ſpecies, and clothed with fur of the moſt exquiſite texture, is an inhabitant of New Wales. In length, from the tip of the noſe to the root of the tail, it is 20 inches; the tail itſelf is 22 inches, at the baſe quite light, increaſing gradually to black at the end: the ears are large and erect: the coat or fur is of a richer and moſt delicate texture; appearing, on the upper parts of the body, at firſt ſight, of a gloſſy black, but on a nicer inſpection found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured ſpot nearly as big as a ſhilling; at this part the fur is thinneſt, but at the root of the tail it is ſo rich and cloſe that the hide cannot be felt through it. The fur is alſo continued to the claws. On each ſide of the body is a broad flap or membrane (as in the flying ſquirrels), which is united to both the fore and hind legs. The jaws are furniſhed with teeth, placed as in ſome others of this genus: in the upper jaw forwards are four ſmall cutting teeth, then two canine ones, and backwards five grinders: the under jaw has two long large cutting teeth, five grinders, with no intermediate canine ones, the ſpace being quite vacant. The fore legs have five toes on each foot, with a claw on each; the hinder ones four toes, with claws (the three outſide ones without any ſeparation), and a thumb without a claw, enabling the animal to uſe the foot as a hand, as many of the opoſſum tribe are obſerved to do.

11. The Cayenne opoſſum has a long ſlender face: ears erect, pointed, and ſhort: the coat woolly, mixed with very coarſe hairs, three inches long, of a dirty white from the roots to the middle; from thence to the ends of a deep brown; ſides and belly of a pale yellow; legs of a duſky brown; thumb on each foot diſtinct; on the toes of the fore feet, and thumb of the hind, are nails; on the toes of the hind feet crooked claws; tail very long, taper, naked, and ſcaly. Length 17 French inches; of the tail fifteen and a half. The ſubject meaſured was young. Inhabits Cayenne: very active in climbing trees, on which it lives the whole day. In marſhy places, feeds on crabs, which when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal ſets up a loud cry, which may be heard afar: its common voice is a grunt like a young pig. It is well furniſhed with teeth, and will defend itſelf ſtoutly againſt dogs; brings forth four or five young, which it ſecures in ſome hollow tree. The natives eat theſe animals, and ſay their fleſh reſembles a hare. They are eaſily tamed, and will then refuſe no kind of food.

12. The New Holland opoſſum has the upper part of the head, and the back and ſides, covered with long, ſoft, gloſſy hairs, of a dark cinereous colour at the bottoms, and of a ruſty brown towards the ends: the belly is of a dirty white. The tail is taper, covered with ſhort brown hairs, except for four inches and a half of the end, which is white, and naked underneath; the toes like thoſe of the former. Deſcribed by Mr Pennant from a ſkin, the length of which, from the head to the tail, was 13 inches, and the tail the ſame. The animal was found near Endeavour river, on the eaſtern coaſt of New Holland, with two young ones. It lodges in the graſs, but is not common. There are two or three other ſpecies.

DIDO, called alſo Elisa, a daughter of Belus king of Tyre, who married Sichæus or Sicharbas her uncle, who was prieſt of Hercules. Pygmalion, who ſucceeded to the throne of Tyre after Belus, murdered Sichæus to get poſſeſſion of the immenſe riches which he had; and Dido, diſconſolate for the loſs of her huſband, whom ſhe tenderly loved, and by whom ſhe was equally eſteemed, ſet ſail in queſt of a ſettlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to ſome accounts, ſhe threw into the ſea the riches of her huſband which Pygmalion ſo greedily deſired, and by that artifice compelled the ſhips to fly with her that had come by order of the tyrant to obtain the riches of Sichæus. During her voyage, Dido viſited the coaſt of Cyprus; where ſhe carried away 50 women who proſtituted themſelves on the ſea-ſhore, and gave them as wives to her Tyrian followers. A ſtorm drove her fleet on the African coaſt, and ſhe bought of the inhabitants as much land as could be covered by a bull's hide cut into thongs. Upon this piece of land ſhe built a citadel called *Byrſa;* and the increaſe of population, and the riſing commerce among her ſubjects, ſoon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterpriſe, gained her many admirers; and her ſubjects wiſhed to compel her to marry Iarbas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her deciſive anſwer; and during that time ſhe erected a funeral pile, as if wiſhing by a ſolemn ſacrifice to appeaſe the manes of Sichæus, to which ſhe had promiſed eternal fidelity. When all was prepared, ſhe ſtabbed herſelf on the pile in preſence of her people; and by this uncommon action obtained the name of *Dido*, "valiant woman," inſtead of Eliſa. According to Virgil and Ovid, the death of Dido was cauſed by the ſudden departure of Æneas; of whom ſhe was deeply enamoured, and whom ſhe could not obtain as a huſband. This poetical fiction repreſents Æneas as living in the age of Dido, and introduces an anachroniſm of near 300 years. Dido left Phœnicia 247 years after the Trojan war or the age of Æneas, that is, about 953 years before Chriſt. This chronological error proceeds not from the ignorance of the poets, but it is ſupported by the authority of Horace:

> *Aut famam ſequere, aut ſibi convenientia finge.*

While Virgil deſcribes, in a beautiful epiſode, the deſperate love of Dido, and the ſubmiſſion of Æneas to the will of the gods, he at the ſame time gives an explanation of the hatred which exiſted between the republics of Rome and Carthage; and informs his reader, that their mutual enmity originated in their very firſt foundation, and was apparently kindled by a more remote cauſe than the jealouſy and rivalſhip of two flouriſhing empires. Dido after her death was honoured as a deity by her ſubjects.

DIDUS, or DODO, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two tranſverſe rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. Only one ſpecies, the ineptus, is mentioned by Linnæus; but three are deſcribed by Buffon: though it is doubted whether on further obſervation they may not all prove one and the ſame ſpecies, differing only in ſex or age.

1. The dronte, or hooded dodo, (ineptus, *Lin.*), is ſomewhat bigger than a ſwan, and near three feet in length. The bill is ſtrong, large, and hooked at the end; the gape ſtretches beyond the eyes: the colour of it is a very pale blue; except the end of the upper mandible, which is yellowiſh, and a red ſpot on the bend of it; the end of the lower is blackiſh: the irides are white. The general colour of the plumage is cinereous, and ſoft to the touch; the belly and thighs are whitiſh. The head is large, and ſeems as it were covered with a black hood or cowl. The wings are very ſhort, and of a yellowiſh aſh-colour: the tail feathers are curled, ſtand up on the rump, and incline to yellow. The legs have four toes, three before and one behind; are very ſtout, ſhort, and yellowiſh: the claws are black. It inhabits the iſlands of Mauritius and Bourbon in the Indian Ocean.

2. The ſolitaire, or ſolitary dodo, is a large bird, and the male is ſaid to weigh ſometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not creſted, and the general colour of the plumage is grey and brown mixed: it has ſcarce any tail, and the baſtard wing ſwells out into a round knob: the wings are too ſhort for flight; and the hind parts are rounded like a horſe's rump, being clothed with feathers, which may be termed *coverts.* —The females are covered with ſometimes brown and ſometimes light yellow feathers, and appear very beautiful. The feathers on each ſide of the breaſt enlarge into two white tufts, ſomewhat reſembling the boſom of a woman. Thoſe of the thighs are rounded at the end like ſhells; and, according to Leguat, the bird has altogether a noble and elegant gait. This is an inhabitant of the Iſle of Rodrigue, where it is not uncommon; but not met with in flocks, ſcarcely more than two being found together. It makes the neſt in by-places, of leaves of the palm, a foot and a half in thickneſs; and lays one egg, bigger than that of a gooſe. The male ſits in his turn; and does not ſuffer any bird to approach within 200 yards of the ſpot while the hen is ſitting, which is ſeven weeks. The young is ſome months before it can ſhift for itſelf; the old ones, in the mean time, are affectionate to it, and faithful to each other afterwards, though they occaſionally may mix with others of their kind. The young birds, though timid, are ſtupid enough to ſuffer the approach of any one; but when grown up are more ſhy, and will not be tamed. They are chaſed in the winter ſeaſon, *viz.* from March to September; being then fat, and the young birds are much eſteemed for the table.

3. The Nazarene dodo is bigger than a ſwan. The bill is a little bent downwards and large: inſtead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has ſome frizzled ones upon the rump, which ſerve inſtead of a tail: the legs are long and ſcaly, and there are three toes on each foot. This was met with in the Iſle of France, and deſcribed as above by Fr. Cauche; who adds, that the female only lays one egg, which is white, and as big as a penny loaf, and that there is always found with it a white ſtone of the ſize of an hen's egg; that it makes the neſt of leaves and dry herbs, in the foreſts, on the ground; and that there is likewiſe found a grey ſtone in the gizzard of the young bird.

DIDYMUS of Alexandria, an eccleſiaſtical writer of the fourth century; who, though he is ſaid to have loſt his eyes at five years of age, when he had ſcarcely learned to read, yet applied ſo earneſtly to ſtudy, that he attained all the philoſophic arts in a high degree, and was thought worthy to fill the chair in the famous divinity-ſchool at Alexandria. He was the author of a great number of works: but all we have now remaining are, a Latin tranſlation of his book upon the Holy Spirit, in the works of St Jerome, who was the tranſlator; ſhort ſtrictures on the Canonical Epiſtles; and a book againſt the Manichees.

DIDYNAMIA (from δις *twice*, and δυναμις *power*), the name of the 14th claſs in Linnæus's ſexual method; conſiſting of plants with hermaphrodite flowers, which have four ſtamina or male organs, two of which are long and two ſhort. See BOTANY, the Scheme, and Plate CII. fig. 14.

DIEMEN's LAND, the ſouthern coaſt or point of New Holland, S. Lat. 43° 21′ 20″, E. Long. 147° 29′. This coaſt was diſcovered in November 1642 by Taſman, who gave it the name of *Van Diemen's Land*. Captain Furneaux touched at it in March 1773, and the country has been ſince further explored by our late navigators. Here is a very ſafe road, named by Captain Cook *Adventure Bay*. The parts adjoining to the bay are moſtly hilly, and form an entire foreſt of tall trees, rendered almoſt impaſſable by brakes of fern, ſhrubs, &c. The ſoil on the flat land, and on the lower part of the hills, is ſandy, or conſiſts of a yellowiſh earth, and in ſome parts of a reddiſh clay; but further up the hills it is of a grey tough caſt. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ſtones of any other kind than the white ſand-ſtone, were obſerved: nor any vegetables that afforded ſubſiſtence for man. The foreſt-trees are all of one kind, generally quite ſtraight, and bearing cluſters of ſmall white flowers. The principal plants obſerved were wood-ſorrel, milk-wort, cudweed, bell-flower, gladiolus, ſamphire, and ſeveral kinds of fern. The only quadruped ſeen diſtinctly was a ſpecies of opoſſum, about twice the ſize of a large rat. The kanguroo, found farther northward in New Holland, may alſo be ſuppoſed to inhabit here, as ſome of the inhabitants had pieces of the ſkin of that animal. The principal ſorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowiſh paroquets, and a ſpecies which was called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the ſhore were ſeveral gules, black oyſter-catchers or ſea-pies, and plovers of a ſtone-colour. In the woods were ſeen ſome blackiſh ſnakes of a pretty large ſize; and a ſpecies of lizard fifteen inches long and ſix round, beautifully

fully clouded with yellow and black. Among a variety of fiſh caught, were ſome large rays, nurſes, leather-jackets, bream, ſoles, flounders, gurnards, and elephant-fiſh. Upon the rocks are muſcles and other ſhell-fiſh, and upon the beach were found ſome pretty Meduſa's heads. The moſt troubleſome inſects met with were the muſquitoes; and a large black ant, the bit of which inflicts extreme pain.

The inhabitants ſeemed mild and cheerful, with little of that wild appearance which ſavages in general have. They are almoſt totally devoid of perſonal activity or genius, and are nearly upon a par with the wretched natives of Terra del Feugo. They diſplay, however, ſome contrivance in their method of cutting their arms and bodies in lines of different directions, raiſed above the ſurface of the ſkin. Their indifference for preſents offered them, their general inattention and want of curioſity, were very remarkable, and teſtified no acuteneſs of underſtanding. Their complexion is a dull black, which they ſometimes heighten by ſmutting their bodies, as was ſuppoſed from their leaving a mark behind on any clean ſubſtance. Their hair is perfectly woolly, and is clotted with greaſe and red ochre like that of the Hottentots. Their noſes are broad and full, and the lower part of the face projects conſiderably. Their eyes are of a moderate ſize; and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleaſing caſt. Their teeth are not very white nor well ſet, and their mouths are wide: they wear their beards long and clotted with paint. They are upon the whole well proportioned, though their belly is rather protuberant. Their favourite attitude is to ſtand with one ſide forward, and one hand graſping acroſs the back the oppoſite arm, which on this occaſion hangs down by the ſide that projects.

Near the ſhore in the bay were obſerved ſome wretched conſtructions of ſticks covered with bark; but theſe ſeemed to have been only temporary, and they had converted many of their largeſt trees into more comfortable and commodious habitations. The trunks of theſe were hollowed out to the height of ſix or ſeven feet by means of fire. That they ſometimes dwell in them was manifeſt from their hearths in the middle made of clay, round which four or five perſons might ſit. Theſe places of ſhelter are rendered durable by their leaving one ſide of the tree ſound, ſo that it continues growing with great luxuriance.

DIEMERBROEK (Iſbrand), a learned profeſſor of phyſic and anatomy at Utrecht, was born at Montfort, in Holland, in 1609, where he acquired great reputation by his lectures and his practice; and died at Utrecht in 1674. He wrote a treatiſe on the plague, which is eſteemed; and ſeveral learned works in anatomy and medicine, which were printed at Utrecht in 1685 in folio.

DIEPPE, a handſome ſea-port town of France, in Upper Normandy, in the territory of Caux; with a good harbour, an old caſtle, and two handſome moles. The pariſh-church of St James is an elegant ſtructure; and there is a tower from which, in fine weather, the coaſt of England may be ſeen. The principal trade conſiſts in herrings, whitings, mackerel, ivory, toys, and laces. It was bombarded by the Engliſh in 1694, and it is not now ſo conſiderable as it was formerly. It is ſeated at the mouth of the river Argues, in E. Long. 1. 9. N. Lat. 49 55.

DIES MARCHIÆ, was the day of congreſs or meeting of the Engliſh and Scots, annually appointed to be held on the marches or borders, in order to adjuſt all differences between them.

DIESIS, in muſic, is the diviſion of a tone leſs than a ſemitone; or an interval conſiſting of a leſs or imperfect ſemitone.

Dieſis is the ſmalleſt and ſofteſt change or inflexion of the voice imaginable: it is called a *faint*, expreſſed thus X, by a St Andrew's croſs or ſaltier.

DIESPITER, in antiquity, a name given to Jupiter; and ſignifying *diei pater*, "father of the day." St Auguſtin derives the name from *dies* "day," and *partus* "production, bringing forth;" it being Jupiter that brings forth the day. Of which ſentiment were Servius and Macrobius; the former adding, that in the language of the Oſci they called him *Lucentius*, as *Dieſpiter* in Latin.

DIET, in medicine, according to ſome, comprehends the whole regimen or rule of life with regard to the ſix non naturals; air, meats and drinks, ſleep and watching, motion and reſt, paſſions of the mind, retentions and excretions. Others reſtrain the term of *diet* to what regards eating and drinking, or ſolid aliments and drinks. See FOOD.

The natural conſtitution of the body of man is ſuch, that it can eaſily bear ſome changes and irregularities without much injury. Had it been otherwiſe, we ſhould be almoſt conſtantly put out of order by every ſlight cauſe. This advantage ariſes from thoſe wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief.

Thus, when the body is too full, nature cauſes evacuations through ſome of the outlets: and for this reaſon it is, that diſeaſes from inanition are generally more dangerous than from repletion; becauſe we can more expeditiouſly diminiſh than increaſe the juices of the body. Upon the ſame account, alſo, though temperance be beneficial to all men, the ancient phyſicians adviſed perſons in good health, and their own maſters, to indulge a little now and then, by eating and drinking more plentifully than uſual. But, of the two, intemperance in drinking is ſafer than in eating: and if a perſon has committed exceſs in the latter, cold water drank upon a full ſtomach will help digeſtion; to which it will be of ſervice to add lemon juice, or elixir of vitriol. If he has eaten high ſeaſoned things, rich ſauces, &c. then let him ſit up for ſome little time, and afterwards ſleep. But if a man happen to be obliged to faſt, he ought to avoid all laborious work. From ſatiety it is not proper to paſs directly to ſharp hunger, nor from hunger to ſatiety: neither will it be ſafe to indulge abſolute reſt immediately after exceſſive labour, nor ſuddenly to fall to hard work after long idleneſs. In a word, therefore, all changes in the way of living ſhould be made by degrees.

The ſofter and milder kinds of aliment are proper for children, and for youth the ſtronger. Old people ought to leſſen the quantity of their food, and increaſe that of their drink: but yet ſome allowance is to be made for cuſtom, eſpecially in the colder climates like ours; for as in theſe the appetite is keener, ſo is the digeſtion better performed. *Mead's Monita & Præcepta.*

Diet-Drinks, a form in phyſic, including all the medicated wines, ales, and wheys, uſed in chronic caſes. They require a courſe or continuation to anſwer any intention of moment.

Diet of Appearance, in Scots law, the day to which a defender is cited to appear in court; and every other day to which the court ſhall afterwards adjourn the conſideration of the queſtion.

Diet, or *Dyet*, in matters of policy, is uſed for the general aſſembly of the ſtates or circles of the empire of Germany and of Poland, to deliberate and concert meaſures proper to be taken for the good of the public.

The general diet of the empire is uſually held at Ratiſbon. It conſiſts of the emperor, the nine electors, and the eccleſiaſtical princes; *viz.* the archbiſhops, biſhops, abbots, and abbeſſes; the ſecular princes, who are dukes, marquiſes, counts, viſcounts, or barons; and the repreſentatives of the imperial cities. It meets on the emperor's ſummons, and any of the princes may ſend their deputies thither in their ſtead. The diet makes laws, raiſes taxes, determines differences between the ſeveral princes and ſtates, and can relieve the ſubjects from the oppreſſions of their ſovereigns.

The diet of Poland, or the aſſembly of the ſtates, conſiſted of the ſenate and deputies, or repreſentative of every palatinate or county and city; and uſually met every two years, and oftener upon extraordinary occaſions, if ſummoned by the king, or, in his abſence, by the archbiſhop of Gneſna. The general diet of Poland ſat but ſix weeks, and often broke up in a tumult much ſooner: for one diſſenting voice prevented their paſſing any laws, or coming to any reſolutions on what was propoſed to them from the throne. Switzerland has alſo a general diet, which is uſually held every year at Baden, and repreſents the whole Helvetic body: it ſeldom laſts longer than a month. Beſides this general diet, there are diets of the Proteſtant cantons, and diets of the catholic ones: the firſt aſſemble at Araw, and are convoked by the canton of Zurich; the ſecond at Lucern, convoked by the canton of that name.

DIETETIC, denotes ſomething belonging to diet, but particularly that part of phyſic which treats of this ſubject. See Diet, Food, and Drink.

DIETRICH, or Dietricy (Chriſtian William Erneſt), a modern artiſt, who was born at Weimar in 1712. He reſided chiefly at Dreſden, where he was profeſſor of the academy of arts. He was a painter of very extenſive abilities, and ſucceeded both in hiſtory and landſcape. We have by him a great number of ſmall ſubjects, to the amount of 150 or more, which he engraved from his own compoſitions, in the ſtyle, ſays Baſan, of Oſtade of Laireſſe, and of Salvator Roſa. Sixty of theſe etchings are exceedingly rare.

DIETS, a town in the circle of the Upper Rhine in Germany, ſituated on the river Lohn, twenty miles north of Mentz, and ſubject to the houſe of Naſſau-Orange. E. Long. 7. 40. N. Lat. 50. 28.

DIEU et mon droit, i. e. *God and my right*, the motto of the royal arms of England, firſt aſſumed by king Richard I. to intimate that he did not hold his empire in vaſſalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who uſed the motto *Je main tiendray*, though the former was ſtill retained upon the great ſeal. After him queen Anne uſed the motto *Semper eadem*, which had been before uſed by queen Elizabeth; but ever ſince queen Anne, *Dieu et mon droit* continues to be the royal motto.

DIFF, is the name of an inſtrument of muſic among the Arabs, ſerving chiefly to beat time to the voice: it is a hoop, ſometimes with pieces of braſs fixed to it to make a jingling, over which a piece of parchment is diſtended. It is beat with the fingers, and is the true *tympanum* of the ancients.

DIFFARREATION, among the Romans, a ceremony whereby the divorce of their prieſts was ſolemnized. The word comes from the prepoſition *dis*; which is uſed, in compoſition, for *diviſion* or *ſeparation*; and *farreatio*, a ceremony with wheat, of *far* "wheat."

Diffarreation was properly the diſſolving of marriages contracted by confarreation; which were thoſe of the pontifices or prieſts. Feſtus ſays, it was performed with a wheaten cake. Vigenere will have confarreation and diffarreation to be the ſame thing.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is ſubtracted from another.

Difference, in logic, an eſſential attribute belonging to ſome ſpecies, and not found in the genus; being the idea that defines the ſpecies. Thus, body and ſpirit are the two ſpecies of ſubſtance, which in their ideas include ſomething more than is included in the idea of ſubſtance. In body, for inſtance, is found impenetrability and extenſion; in ſpirit, a power of thinking and reaſoning: ſo that the difference of body is impenetrable extenſion, and the difference of ſpirit is cogitation.

Difference, in heraldry, a term given to a certain figure added to coats of arms, ſerving to diſtinguiſh one family from another; and to ſhow how diſtant younger branches are from the elder or principal branch.

DIFFERENTIAL, differentiale, in the higher geometry, an infinitely ſmall quantity, or a particle of quantity ſo ſmall as to be leſs than any aſſignable one. It is called a *differential*, or *differential quantity*, becauſe frequently conſidered as the difference of two quantities; and, as ſuch, is the foundation of the *differential calculus*: Sir Iſaac Newton, and the Engliſh, call it a *moment*, as being conſidered as the momentary increaſe of quantity. See Fluxions.

DIFFORM, Difformis (from *forma* "ſhape"), is a word uſed in oppoſition to *uniform*; and ſignifies, that there is no regularity in the form or appearance of a thing. The botaniſts uſe it as a diſtinction of the flowers of ſeveral ſpecies of plants.

DIFFUSE, an epithet applied to ſuch writings as are wrote in a prolix manner. Among hiſtorians, Salluſt is reckoned ſententious, and Livy diffuſe. Thus alſo among the orators, Demoſthenes is cloſe and conciſe; Cicero, on the other hand, is diffuſe.

DIFFUSION, the diſperſion of the ſubtile effluvia of bodies into a kind of atmoſphere all round them.

Thus the light diffuſed by the rays of the ſun, iſſues all round from that amazing body of fire.

DIGASTRICUS, in anatomy, a muſcle of the lower jaw, called alſo *Biventer*. See ANATOMY, *Table of the Muſcles*.

DIGBY (Sir Kenelm), became very illuſtrious in the 17th century for his virtue and learning. He was deſcended of an ancient family in England. His great-grandfather, accompanied by ſix of his brothers, fought valiantly at Boſworth-field on the ſide of Henry VII. againſt the uſurper Richard III. His father, Everard, ſuffered himſelf to be engaged in the gun-powder plot againſt king James I. and for that crime was beheaded. His ſon wiped off that ſtain, and was reſtored to his eſtate. King Charles I. made him gentleman of the bed-chamber, commiſſioner of the navy, and governor of the Trinity-houſe. He granted him letters of repriſal againſt the Venetians, by virtue whereof he took ſeveral prizes with a ſmall fleet which he commanded. He fought the Venetians near the port of Scanderoon, and bravely made his way through them with his booty. He was a great lover of learning, and tranſlated ſeveral authors into Engliſh; and his "Treatiſe of the Nature of Bodies and the Immortality of the Soul," diſcovers great penetration and extenſive knowledge. He applied to chemiſtry; and found out ſeveral uſeful medicines, which he gave freely away to people of all ſorts, eſpecially to the poor. He diſtinguiſhed himſelf particularly by his ſympathetic powder for the cure of wounds at a diſtance; his diſcourſe concerning which made a great noiſe for a while. He had conferences with Des Cartes about the nature of the ſoul.

In the beginning of the civil wars, he exerted himſelf very vigorouſly in the king's cauſe; but he was afterwards impriſoned, by the parliament's order, in Wincheſter houſe, and had leave to depart thence in 1643. He afterwards compounded for his eſtate, but was ordered to leave the nation; when he went to France, and was ſent on two embaſſies to pope Innocent X. from the queen, widow to Charles I. whoſe chancellor he then was. On the reſtoration of Charles II. he returned to London; where he died in 1665, aged 60.

This eminent perſon was, for the early pregnancy of his parts, and his great proficiency in learning, compared to the celebrated Picus de Mirandola, who was one of the wonders of human nature. His knowledge, though various and extenſive, appeared to be greater than it really was; as he had all the powers of elocution and addreſs to recommend it. He knew how to ſhine in a circle of ladies or philoſophers; and was as much attended to when he ſpoke on the moſt trivial ſubjects, as when he ſpoke on the moſt important. It is ſaid that one of the princes of Italy, who had no child, was deſirous that his princeſs ſhould bring him a ſon by Sir Kenelm, whom he eſteemed a juſt model of perfection.

DIGEST, DIGESTUM, a collection of the Roman laws, ranged and digeſted under proper titles, by order of the emperor Juſtinian.

That prince gave his chancellor Tribonianus a commiſſion for this purpoſe; who, in conſequence thereof, choſe ſixteen juriſconſulti, or lawyers, to work upon the ſame. Theſe, accordingly, took out the beſt and fineſt deciſions from the two thouſand volumes of the ancient juriſconſulti, and reduced them all into one body; which was publiſhed in the year 533, under the name of the *Digeſt*. To this the emperor gave the force of a law, by a letter at the head of the work, which ſerves it as a preface.

The Digeſt makes the firſt part of the Roman law, and the firſt volume of the corpus or body of the civil law, contained in fifty books. It was tranſlated into Greek under the ſame emperor, and called *Pandectæ*. See PANDECTS.

Cujus ſays, that *Digeſt* is a common name for all books diſpoſed in a good order and economy; and hence it is that Tertullian calls the Goſpel of St Luke a Digeſt.

Hence alſo abridgements of the common law are denominated *digeſts* of the numerous caſes, arguments, readings, pleadings, &c. diſperſed in the year-books, and other reports and books of law, reduced under proper heads or common places. The firſt was that of Statham, which comes as low as Henry VI. That of Fitzherbert was publiſhed in 1516; Brook's in 1573, of which Hughes's, publiſhed in 1663, is a ſequel. Rolls, Danvers, and Nelſon, have alſo publiſhed Digeſts or abridgements of this kind, including the caſes of later days; to which may be added the New Abridgement, Viner's Abridgement, &c.

DIGESTION, in the animal economy, is the diſſolution of the aliments into ſuch minute parts as are fit to enter the lacteal veſſels, and circulate with the maſs of blood. See ANATOMY, n° 102.

DIGESTION, in chemiſtry, is an operation which conſiſts in expoſing bodies to a gentle heat, in proper veſſels, and during a certain time. This operation is very uſeful to favour the action of certain ſubſtances upon each other; as, for example, of well calcined, dry, fixed alkali upon rectified ſpirit of wine. When theſe two ſubſtances are digeſted together in a matraſs, with a gentle ſand-bath heat, the ſpirit of wine acquires a yellow-reddiſh colour, and an alkaline quality. The ſpirit would not ſo well acquire theſe qualities by a ſtronger and ſhorter heat.

DIGESTIVE, in medicine, ſuch remedies as ſtrengthen and increaſe the tone of the ſtomach, and aſſiſt in the digeſtion of foods. To this claſs belong all ſtomachics and ſtrengtheners or corroborants.

DIGESTIVE, in ſurgery, denotes a ſort of unguent, plaſter, or the like, that ripens and prepares the matter of wounds, &c. for ſuppuration.

DIGGING, among miners, is appropriated to the operation of freeing any kind of ore from the bed or ſtratum in which it lies, where every ſtroke of their tools turns to account; in contradiſtinction to the openings made in ſearch of ſuch ore, which are called *hatches*, or *eſſay-hatches*; and the operation itſelf, *tracing of mines*, or *hatching*.

When a bed of [illegible] diſcovered, the beele-men, ſo called from the inſtrument they uſe, which is a kind of pick-ax, free the ore from the foſſils around it; and the ſhovel-men throw it up from one ſhamble to another, till it reaches the mouth of the hatch.

In ſome mines, to ſave the expence as well as fatigue of the ſhovel-men, they raiſe the ore by means of a winder and two buckets, one of which goes up as the other comes down.

DIGIT, in aſtronomy, the twelfth part of the diameter of the ſun or moon, uſed to expreſs the quantity of an eclipſe. Thus an eclipſe is ſaid to be of ſix digits, when ſix of theſe parts are hid.

DIGITS, or *Monades*, in arithmetic, ſignify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is alſo a meaſure taken from the breadth of the finger. It is properly ¾ths of an inch, and contains the meaſure of four barley-corns laid breadthwiſe.

DIGITALIS, FOX-GLOVE: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The calyx is quinquepartite; the corolla campanulated, quinquefid, and ventricoſe; the capſule ovate and bilocular.—There are ſix ſpecies; five of which are hardy, herbaceous, biennial, and perennial plants, and the ſixth a tender ſhrubby exotic. The herbaceous ſpecies riſe two or three feet high, crowned with ſpikes of yellow iron-coloured or purple flowers. The ſhrubby ſort riſes five or ſix feet high, having ſpear-ſhaped rough leaves, four or five inches long, and half as broad; the branches being all terminated with flowers growing in looſe ſpikes. All the ſpecies are eaſily raiſed by ſeeds. An ointment made of the flowers of purple fox-glove and May-butter, is much commended by ſome phyſicians for ſcrophulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be adminiſtered to robuſt conſtitutions. The country people in England frequently uſe a decoction of it with polypody of the oak in epileptic fits. An infuſion of two drams of the leaf in a pint of water, given in half-ounce doſes every two hours or ſo, till it begin to puke or purge, is recommended in dropſy, particularly that of the breaſt. It is ſaid to have produced an evacuation of water ſo copious and ſudden, in aſcites, by ſtool and urine, that the compreſſion of bandages was found neceſſary. The plentiful uſe of diluents is ordered during its operation. The remedy, however, is inadmiſſible in very weakly patients. But beſides being given in infuſion, it has alſo been employed in ſubſtance. And when taken at bed-time to the extent of one, two, or three, grains of the dried powder, it often in a ſhort time operates as a very powerful diuretic, without producing any other evacuation. Even this quantity, however, will ſometimes excite very ſevere vomiting, and that too occurring unexpectedly. During its operation it has often very remarkable influence in rendering the pulſe ſlower; and it frequently excites very conſiderable vertigo, and an affection of viſion. Fox-glove has of late alſo been employed in ſome inſtances of hæmoptyſis, of phthiſis, and of mania, with apparent good effects: but its uſe in theſe diſeaſes is much leſs common than in dropſy.

DIGITATED, among botaniſts. See BOTANY, p. 445, n° 230, and Plate CV. fig. 102.

DIGLYPH, in architecture, a kind of imperfect triglyph, conſole, or the like; with two channels or engravings, either circular or angular.

DIGNE, an epiſcopal town of Provence in France, famous for the baths that are near it. It is ſeated on a river called Marderic, in E. Long. 5. 27. N. Lat. 44. 45.

DIGNITARY, in the canon law, a perſon who holds a dignity, that is, a benefice which gives him ſome pre-eminence over mere prieſts and canons. Such is a biſhop, dean, arch deacon, prebendary, &c.

DIGNITY, as applied to the titles of noblemen, ſignifies honour and authority. And dignity may be divided into ſuperior and inferior; as the titles of duke, earl, baron, &c are the higheſt names of dignity; and thoſe of baronet, knight, ſerjeant at law, &c. the loweſt. Nobility only can give ſo high a name of dignity as to ſupply the want of a ſurname in legal proceedings; and as the omiſſion of a name of dignity may be pleaded in abatement of a writ, &c. ſo it may be where a peer who has more than one name of dignity, is not named by the Moſt Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of of ESQUIRE.

DIGNITY, in the human character, the oppoſite of *Meanneſs*.

Man is endued with a SENSE of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature conſiſts in virtue, particularly in virtues of the higheſt rank. To expreſs that ſenſe, the term *dignity* is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty: it is a duty every man owes to himſelf. By acting in that manner, he attracts love and eſteem: by acting meanly, or below himſelf, he is diſapproved and contemned.

This ſenſe of the dignity of human nature reaches even our pleaſures and amuſements. If they enlarge the mind by raiſing grand or elevated emotions, or if they humanize the mind by exerciſing our ſympathy, they are approved as ſuited to the dignity of our nature: if they contract the mind by fixing it on trivial objects, they are contemned as not ſuited to the dignity of our nature. Hence, in general, every occupation, whether of uſe or amuſement, that correſponds to the dignity of man, is termed *manly;* and every occupation below his nature, is termed *childiſh*.

To thoſe who ſtudy human nature, there is a point which has always appeared intricate: How comes it that generoſity and courage are more eſteemed, and beſtow more dignity, than good-nature, or even juſtice; though the latter contribute more than the former to private as well as to public happineſs? This queſtion, bluntly propoſed, might puzzle even a philoſopher; but, by means of the foregoing obſervations, will eaſily be ſolved. Human virtues, like other objects, obtain a rank in our eſtimation, not from their utility, which is a ſubject of reflection, but from the direct impreſſion they make on us. Juſtice and good-nature are a ſort of negative virtues, that ſcarce make any impreſſion but when they are tranſgreſſed: courage and generoſity, on the contrary, producing elevated emotions, enliven greatly the ſenſe of a man's dignity, both in himſelf and in others; and for that reaſon, courage and generoſity are in higher regard than the other virtues mentioned: we deſcribe them as grand and elevated, as of greater dignity, and more praiſe-worthy.

This leads us to examine more directly emotions and paſſions with reſpect to the preſent ſubject: and it will not be difficult to form a ſcale of them, beginning with the meaneſt, and aſcending gradually to thoſe of the higheſt rank and dignity. Pleaſure felt as at the organ of ſenſe, named *corporeal pleaſure*, is perceived to be low; and when indulged to exceſs, is perceived alſo to be mean: for that reaſon, perſons of any delicacy diſſemble the pleaſure they take in eating and drinking. The pleaſures of the eye and ear, having no organic feeling, and being free from any ſenſe of meanneſs, are indulged without any ſhame: they even riſe to a certain degree of dignity when their objects are grand or elevated. The ſame is the caſe of the ſympathetic paſſions: a virtuous perſon behaving with fortitude and dignity under cruel misfortunes, makes a capital figure; and the ſympathiſing ſpectator feels in himſelf the ſame dignity. Sympathetic diſtreſs at the ſame time never is mean: on the contrary, it is agreeable to the nature of a ſocial being, and has general approbation. The rank that love poſſeſſes in the ſcale, depends in a great meaſure on its object: it poſſeſſes a low place when founded on external properties merely; and is mean when beſtowed on a perſon of inferior rank without any extraordinary qualification: but when founded on the more elevated internal properties, it aſſumes a conſiderable degree of dignity. The ſame is the caſe of friendſhip. When gratitude is warm, it animates the mind; but it ſcarce riſes to dignity. Joy beſtows dignity when it proceeds from an elevated cauſe.

If we can depend upon induction, dignity is not a property of any diſagreeable paſſion: one is ſlight, another ſevere; one depreſſes the mind, another animates it; but there is no elevation, far leſs dignity, in any of them. Revenge, in particular, though it enflame and ſwell the mind, is not accompanied with dignity, not even with elevation: it is not however felt as mean or groveling, unleſs when it takes indirect meaſures for gratification. Shame and remorſe, though they ſink the ſpirits, are not mean. Pride, a diſagreeable paſſion, beſtows no dignity in the eye of a ſpectator. Vanity always appears mean; and extremely ſo where founded, as commonly happens, on trivial qualifications.

We proceed to the pleaſures of the underſtanding, which poſſeſs a high rank in point of dignity. Of this every one will be ſenſible, when he conſiders the important truths that have been laid open by ſcience; ſuch as general theorems, and the general laws that govern the material and moral worlds. The pleaſures of the underſtanding are ſuited to man as a rational and contemplative being, and they tend not a little to ennoble his nature; even to the Deity he ſtretcheth his contemplations, which, in the diſcovery of infinite power, wiſdom, and benevolence, afford delight of the moſt exalted kind. Hence it appears, that the fine arts, ſtudied as a rational ſcience, afford entertainment of great dignity; ſuperior far to what they afford as a ſubject of taſte merely.

But contemplation, however in itſelf valuable, is chiefly reſpected as ſubſervient to action; for man is intended to be more an active than a contemplative being. He accordingly ſhows more dignity in action than in contemplation: generoſity, magnanimity, heroiſm, raiſe his character to the higheſt pitch: theſe beſt expreſs the dignity of his nature, and advance him nearer to divinity than any other of his attributes.

Having endeavoured to aſſign the efficient cauſe of dignity and meanneſs, by unfolding the principle on which they are founded, we proceed to explain the final cauſe of the dignity or meanneſs beſtowed upon the ſeveral particulars above mentioned, beginning with corporeal pleaſures. Theſe, as far as uſeful, are, like juſtice, fenced with ſufficient ſanctions to prevent their being neglected: hunger and thirſt are painful ſenſations; and we are incited to animal love by a vigorous propenſity: were corporeal pleaſures dignified over and above with a place in a high claſs, they would infallibly overturn the balance of the mind, by outweighing the ſocial affections. This is a ſatisfactory final cauſe for refuſing to theſe pleaſures any degree of dignity: and the final cauſe is not leſs evident of their meanneſs when they are indulged to exceſs. The more refined pleaſures of external ſenſe, conveyed by the eye and the ear from natural objects and from the fine arts, deſerve a high place in our eſteem, becauſe of their ſingular and extenſive utility: in ſome caſes they riſe to a conſiderable dignity; and the very loweſt pleaſures of the kind are never eſteemed mean or groveling. The pleaſure ariſing from wit, humour, ridicule, or from what is ſimply ludicrous, is uſeful, by relaxing the mind after the fatigue of more manly occupation: but the mind, when it ſurrenders itſelf to pleaſure of that kind, loſes its vigour, and ſinks gradually into ſloth. The place this pleaſure occupies in point of dignity, is adjuſted to theſe views: to make it uſeful as a relaxation, it is not branded with meanneſs; to prevent its uſurpation, it is removed from that place but a ſingle degree: no man values himſelf for that pleaſure, even during gratification; and if it have engroſſed more of his time than is requiſite for relaxation, he looks back with ſome degree of ſhame.

In point of dignity, the ſocial emotions riſe above the ſelfiſh, and much above thoſe of the eye and ear: man is by his nature a ſocial being; and to qualify him for ſociety, it is wiſely contrived, that he ſhould value himſelf more for being ſocial than ſelfiſh.

The excellency of man is chiefly diſcernible in the great improvements he is ſuſceptible of in ſociety: theſe, by perſeverance, may be carried on progreſſively, above any aſſignable limits; and even abſtracting from revelation, there is great probability, that the progreſs begun here will be completed in ſome future ſtate. Now, as all valuable improvements proceed from the exerciſe of our rational faculties, the Author of our nature, in order to excite us to a due uſe of theſe faculties, hath aſſigned a high rank to the pleaſures of the underſtanding: their utility, with reſpect to this life as well as a future, intitles them to that rank.

But as action is the aim of all our improvements, virtuous actions juſtly poſſeſs the higheſt of all the ranks. Theſe, we find, are by nature diſtributed into different claſſes, and the firſt in point of dignity aſſigned to actions that appear not the firſt in point of uſe: generoſity, for example, in the ſenſe of mankind is more reſpected than juſtice, though the latter is undoubtedly more eſſential to ſociety; and magnanimity, heroiſm, undaunted courage, riſe ſtill higher in our eſteem: The reaſon of which is explained above.

Dignity, in oratory, is one of the three parts of general elocution; and conſiſts in the right uſe of tropes and figures. See Oratory, n° 48.

DIGON, an ancient, handſome, rich, and very conſiderable town of France; capital of Burgundy, and of the Digonois; with a parliament, biſhop's ſee, a mint, an univerſity, academy of ſciences, an abbey, and a citadel: moſt part of the churches and public ſtructures are very beautiful, and in one of the ſquares there is an equeſtrian ſtatue of Louis XIV. It is ſeated in a very pleaſant plain between two ſmall rivers, which produces excellent wine. E. Long. 5. 7. N. Lat. 47. 19.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the ſubject we are upon to ſome different thing, which, however, may be of ſervice to it. See Oratory, n° 37.

DIGYNIA, (from δις *twice*, and γυνη a *woman*), the name of an order or ſecondary diviſion in each of the firſt 13 claſſes, except the 9th, in Linnæus's ſexual method; conſiſting of plants, which to the claſſic character, whatever it is, add the circumſtance of having two ſtyles or female organs.

DII, the divinities of the ancient inhabitants of the earth, were very numerous. Every object which cauſed terror, inſpired gratitude, or beſtowed affluence, received the tribute of veneration. Man ſaw a ſuperior agent in the ſtars, the elements, or the trees, and ſuppoſed that the waters which communicated fertility to his fields and poſſeſſions, were under the influence and direction of ſome inviſible power inclined to favour and to benefit mankind. Thus aroſe a train of divinities which imagination arrayed in different forms, and armed with different powers. They were endowed with underſtanding, and were actuated by the ſame paſſions which daily afflict the human race, and thoſe children of ſuperſtition were appeaſed or provoked as the imperfect being which gave them birth. Their wrath was mitigated by ſacrifices and incenſe, and ſometimes human victims bled to expiate a crime, which ſuperſtition alone ſuppoſed to exiſt. The ſun, from his powerful influence and animating nature, firſt attracted the notice and claimed the adoration of the uncivilized inhabitants of the earth. The moon alſo was honoured with ſacrifices and addreſſed in prayers, and after immortality had been liberally beſtowed on all the heavenly bodies, mankind claſſed among their deities the brute creation, and the cat and the ſow ſhared equally with Jupiter himſelf, the father of gods and men, the devout veneration of their votaries. This immenſe number of deities have been divided into different claſſes according to the will and pleaſure of the mythologiſts. The Romans, generally ſpeaking, reckoned two claſſes of the gods, the *dii majorum gentium*, or *dii conſulentes*, and the *dii minorum gentium*. The former were 12 in number, ſix males and ſix females. [*Vid.* Consentes.] In the claſs of the latter were ranked all the gods which were worſhipped in different parts of the earth. Beſides theſe there were ſome called *dii ſelecti*, ſometimes claſſed with the 12 greater gods; theſe were Janus, Saturn, the Genius, the Moon, Pluto, and Bacchus. There were alſo ſome called demi-gods, that is, who deſerved immortality by the greatneſs of their exploits, and for their uncommon ſervices to mankind. Among theſe were Priapus, Vertumnus, Hercules, and thoſe whoſe parents were ſome of the immortal gods. Beſides theſe, all the paſſions and the moral virtues were reckoned as powerful deities, and temples were raiſed to a goddeſs of concord, peace, &c. According to the authority of Heſiod, there were no leſs than 30,000 gods that inhabited the earth, and were guardians of men, all ſubſervient to the power of Jupiter. To theſe, ſucceeding ages have added an almoſt equal number; and indeed they were ſo numerous, and their functions ſo various, that we find temples erected, and ſacrifices offered, to unknown gods. It is obſervable, that all the gods of the ancients have lived upon earth as mere mortals; and even Jupiter, who was the ruler of heaven, is repreſented by the mythologiſts as a helpleſs child; and we are acquainted with all the particulars that attended the birth and education of Juno. In proceſs of time, not only good and virtuous men, who had been the patrons of learning and the ſupporters of liberty, but alſo thieves and pirates, were admitted among the gods, and the Roman ſenate courteouſly granted immortality to the moſt cruel and abandoned of their emperors.

DIJAMBUS, in poetry, the foot of a Latin verſe of four ſyllables; it is compounded of two *iambics*, as *ſĕvērĭtās*.

DIKE, a ditch or drain, made for the paſſage of waters.—The word ſeems formed from the verb to *dig*; tho' others chooſe to derive it from the Dutch, *diik*, a dam, ſea-bank, or wall.

Dike, or *Dyke*, alſo denotes a work of ſtone, timber or faſcines, raiſed to oppoſe the entrance or paſſage of the waters of the ſea, a river, lake, or the like. —The word comes from the Flemiſh *dyk*, or *diik*, a heap of earth to bound or ſtem the water. Junius and Menage take the Flemiſh to have borrowed their word from the Greek τειχος, *wall*. Guichard derives it from the Hebrew *daghab*. Theſe dikes are uſually elevations of earth, with hurdles of ſtakes, ſtones, and other matters.

The dike of Rochelle is made with veſſels faſtened to the bottom. The dikes of Holland are frequently broke through, and drown large tracts of land.

DILAPIDATION, in law, a waſteful deſtroying or letting buildings, eſpecially parſonage-houſes, &c. run to decay, for want of neceſſary reparation. If the clergy neglect to repair the houſes belonging to their benefices, the biſhop may ſequeſter the profits thereof for that purpoſe. And in theſe caſes, a proſecution may be brought either in the ſpiritual court or at common law, againſt the incumbent himſelf, or againſt his executor or adminiſtrator.

DILATATION, in phyſics, a motion of the parts of any body, by which it is ſo expanded as to occupy a greater ſpace. This expanſive motion depends upon the elaſtic power of the body; whence it appears that dilatation is different from rarefaction, this laſt being produced by the means of heat.

DILATATORES, in anatomy, a name given to ſeveral muſcles in the human body. See Anatomy, *Table of the Muſcles*.

DILATORY pleas, in law, are ſuch as are put in merely for delay; and there may be a demurrer to a dilatory plea, or the defendant ſhall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, &c. by ſtat. 4 and 5 Anne. See Plea.

DILATRIS, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants. There is no calyx; the corolla has ſix petals, and is ſhaggy; the ſtigma ſimple.

DILEMMA, in logic, an argument equally concluſive by contrary ſuppoſitions. See Logic.

DILIGENCE, in Scots law, ſignifies either that care and attention which parties are bound to give, in implementing certain contracts or truſts, and which varies according to the nature of the contract; as to which, ſee Law, Nº clxi. 12, 13. clxxiii. 8. & clxxxi. 18. Or it ſignifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the perſon or eſtate of the debtor; *ibid.* Nº clxxi. clxxii.

DILL, in botany. See Anethum.

DILLEMBURG, a town of Germany, in Wetteravia, and capital of a county of the ſame name. It is ſubject to a prince of the houſe of Naſſau, and is ſituated in E. Long. 8. 24. N. Lat. 50. 45.

DILLENGEN, a town of Germany, in the circle of Suabia, with an univerſity, and where the biſhop of Augſburg reſides. It is ſeated near the Danube, in E. Long. 11. 35. N. Lat. 48. 38.

DILLENIA, in botany, a genus of the polygynia belonging to the polyandria claſs of plants. The calyx is pentaphyllous; the petals five; the capſules numerous, polyſpermous, coalited, and full of pulp.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more ſo, by the addition of a thinner thereto. Theſe things thus added are called *diluents*, or *dilutors*.

DIMACHÆ, (from δις *double*, and μαχω *I fight*,) in antiquity, a kind of horſemen, firſt inſtituted by Alexander. Their armour was lighter than that of the infantry, and at the ſame time heavier than that uſed by horſemen, ſo that they could act as horſe or foot as occaſion required.

DIMENSION, in geometry, is either length, breadth, or thickneſs; hence, a line hath one dimenſion, *viz.* length; a ſuperficies two, *viz.* length and breadth; and a body, or ſolid, has three, *viz.* length, breadth, and thickneſs.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made leſs than that of the lower part*.

DIMINUTIVE, in grammar, a word formed from ſome other, to ſoften or diminiſh the force of it, or to ſignify a thing is little in its kind. Thus, *cellule* is a diminutive of *cell*, globule of *globe*, hillock of *hill*.

DIMISSORY letters, *Literæ Dimiſſoriæ*, in the canon law, a letter given by a biſhop to a candidate for holy orders, having a title in his dioceſe, directed to ſome other biſhop, and giving leave for the bearer to be ordained by him.

When a perſon produces letters of ordination or tonſure, conferred by any other than his own dioceſan, he muſt at the ſame time produce the letters dimiſſory given by his own biſhop, on pain of nullity.

Letters dimiſſory cannot be given by the chapter, *ſede vacante*; this being deemed an act of voluntary juriſdiction, which ought to be reſerved to the ſucceſſor.

DIMŒRITÆ, a name given to the Apollinariſts, who at firſt held, that the word only aſſumed a human body, without taking a reaſonable ſoul like ours; but being at length convinced by formal texts of ſcripture, they allowed, that he did aſſume a ſoul, but without underſtanding; the word ſupplying the want of that faculty. From this way of ſeparating the underſtanding from the ſoul, they became denominated *dimœrites*, q. d. *dividers*, *ſeparaters*, of δια and μοιραω, *I divide*.

DINDYMA-orum, (Virgil,) from Dindymus-i; a mountain allotted by many to Phrygia. Strabo has two mountains of this name; one in Myſia near Cyzicus; the other in Gallograecia near Peſſinûs; and none in Phrygia. Ptolemy extends this ridge from the borders of Troas, through Phrygia to Gallograecia: though therefore there were two mountains called Dindymus in particular, both ſacred to the mother of the gods, and none of them in Phrygia Major; yet there might be ſeveral hills and eminences in it, on which this goddeſs was worſhipped, and therefore called *Dindyma* in general. Hence Cybele is ſurnamed *Dindymane*, (Horace.)

DINGWAL, a parliament-town of Scotland in the ſhire of Roſs, ſeated on the frith of Cromarty, 15 miles weſt of the town of Cromarty. Near it runs the river Conel, famous for producing pearls. W. Long. 4. 15. N. Lat. 57. 45. Dingwal was a Scotch barony in the perſon of the duke of Ormond in right of his lady, but forfeited in 1715.

DINNER, the meal taken about the middle of the day.—The word is derived from the French *diſuer*, which Du Cange derives from the barbarous Latin *diſnare*. Henry Stephens derives it from the Greek δειπνειν; and will have it wrote *dipner*. Menage deduces it from the Italian *deſinare*, "to dine"; and that from the Latin *deſinere*, "to leave off work."

It is generally agreed to be the moſt ſalutary to make a plentiful dinner, and to eat ſparingly at ſupper. This is the general practice among us. The French, however, in imitation of the ancient Romans, defer their good cheer to the evening; and Bernardinus Paternus, an eminent Italian phyſician, maintains it to be the moſt wholeſome method, in a treatiſe expreſsly on the ſubject.

The grand Tartar emperor of China, after he has dined, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth to go to dinner; as if they waited for his leave.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Epheſus, when burnt by Eroſtratus, with much more magnificence than before. Vitruvius informs us that Dinocrates propoſed to Alexander the Great to convert mount Athos into the figure of a man, whoſe left hand ſhould contain a walled city, and all the rivers of the mount flow into his right, and from thence into the ſea! He alſo conceived a ſcheme for building the dome of the temple of Arſinoe at Alexandria, of loadſtone; that ſhould by its attraction uphold her iron image in the centre, ſuſpended in the air! Projects which at leaſt ſhowed a vaſt extent of imagination.

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* See *Architecture*, nº 38.

DIO CHRYSOSTOM that is, *Golden Mouth*, a celebrated orator and philoſopher of Greece, in the firſt century, was born at Pruſa in Bithynia. He attempted to perſuade Veſpaſian to quit the empire; was hated by Domitian; but acquired the eſteem of Trajan This laſt prince took pleaſure in converſing with him, and made him ride with him in his triumphal chariot. There are ſtill extant, 80 of Dio's orations, and ſome other of his works: the beſt edition of which is that of Hermand Samuel Raimarus, in 1750, in folio.

DIOCESE, or DIOCESS, the circuit or extent of the juriſdiction of a BISHOP.--The word is formed from the Greek διοικησις, *government*, *adminiſtration*; formed of διοικεω, which the ancient gloſſaries render *adminiſtro*, *moderor*, *ordino*: hence διοικησις της πολεως, the *adminiſtration* or *government of a city*.

DIOCESE is alſo uſed in ancient authors, &c. for the province of a METROPOLITAN.

Diocæſis, διοικησις, was originally a civil government, or prefecture, compoſed of divers provinces.

The firſt diviſion of the empire into dioceſes is ordinarily aſcribed to Conſtantine; who diſtributed the whole Roman ſtate into four, viz. the dioceſe of Italy, the dioceſe of Illyria, that of the eaſt, and that of Africa. And yet, long before Conſtantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p. 432. that the Romans had divided Aſia into dioceſes; and complains of the confuſion ſuch a diviſion occaſioned in geography, Aſia being no longer divided by people, but by dioceſes, each whereof had a tribunal or court, where juſtice was adminiſtered. Conſtantine, then, was only the inſtitutor of thoſe large dioceſes, which comprehended ſeveral metropoles and governments; the former dioceſes only comprehending one juriſdiction or diſtrict, or the country that had reſort to one judge, as appears from this paſſage in Strabo, and (before Strabo) from Cicero himſelf, lib. iii. *epiſt. ad famil.* 9. and lib. xiii. *ep.* 67.

Thus, at firſt a province included divers dioceſes; and afterwards a dioceſe came to compriſe divers provinces. In after times the Roman empire became divided into 13 dioceſes or prefectures; though, including Rome, and the ſuburbicary regions, there were 14. Theſe 14 dioceſes comprehended 120 provinces: each province had a proconſul, who reſided in the capital or metropolis; and each dioceſe of the empire had a conſul, who reſided in the principal city of the diſtrict.

On this civil conſtitution, the eccleſiaſtical one was afterwards regulated: each dioceſe had an eccleſiaſtical vicar or primate, who judged finally of all the concerns of the church within his territory.

At preſent there is ſome further alteration: for dioceſe does not now ſignify an aſſemblage of divers provinces; but is limited to a ſingle province under a metropolitan, or more commonly to the ſingle juriſdiction of a biſhop.

Gul. Brito affirms dioceſe to be properly the territory and extent of a baptiſmal or parochial church; whence divers authors uſe the word to ſignify a ſimple pariſh. See PARISH.

DIOCLEIA, Διοκλεια, in antiquity, a ſolemnity kept in the ſpring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

DIOCLESIANUS (Caius Valerius Jovius), a celebrated Roman emperor born of an obſcure family in Dalmatia in 245. He was firſt a common ſoldier, and by merit and ſucceſs he gradually roſe to the office of a general; and at the death of Numerian in 284 he was inveſted with imperial power. In this high ſtation he rewarded the virtues and fidelity of Maximian, who had ſhared with him all the ſubordinate offices in the army, by making him his colleague on the throne. He created two ſubordinate emperors Conſtantius and Galerius, whom he called Cæſars, whilſt he claimed for himſelf and his colleague the ſuperior title of Auguſtus. Diocleſian has been celebrated for his military virtues; and though he was naturally unpoliſhed by education and ſtudy, yet he was the friend and patron of learning and true genius. He was bold and reſolute, active and diligent, and well acquainted with the arts, which will endear a ſovereign to his people, and make him reſpectable even in the eyes of his enemies. His cruelty, however, againſt the followers of Chriſtianity, has been deſervedly branded with infamy. After he had reigned 22 years in the greateſt proſperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private ſtation at Salona. Maximian his colleague followed his example, but not from voluntary choice; and when he ſome time after endeavoured to rouſe the ambition of Diocleſian, and perſuade him to re-aſſume the imperial purple, he received for anſwer, that Diocleſian took now more delight in cultivating his little garden than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greateſt ſecurity and enjoyment at Salona, and died in 314, in the 68th year of his age. Diocleſian is the firſt ſovereign who voluntarily reſigned his power. His bloody perſecution of the Chriſtians forms a chronological era, called the *era of Diocleſian*, or of the martyrs. It was for a long time in uſe in theological writings, and is ſtill followed by the Copts and Abyſſinians. It commenced Auguſt 29. 284.

DIOCTAHEDRIA, in natural hiſtory, a genus of pellucid and cryſtalliform ſpars, compoſed of two octangular pyramids, joined baſe to baſe, without any intermediate column. Of theſe ſome have long pyramids, others ſhort and ſharp-pointed ones, and others ſhort and obtuſe-pointed ones; the two former ſpecies being found in the Hartz-foreſt, and the laſt in the mines of Cornwall.

DIODATI (John), a famous miniſter, and profeſſor of theology at Geneva, was born at Lucca in 1579, and died at Geneva in 1652. He is diſtinguiſhed by tranſlations, 1. of the Bible into Italian, with notes, Geneva 1607, 4to. The beſt edition at Geneva in 1641, folio. This is ſaid to be more a paraphraſe than a tranſlation, and the notes rather divine meditations than critical reflections. 2. Of the Bible into French, Geneva, 1644. 3. Of Father Paul's Hiſtory of the Council of Trent into French.

DIODIA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is monopetalous and funnel-ſhaped; the capſule bilocular and diſpermous.

DIODON, or SUN-FISH, in ichthyology, a genus belonging to the order of amphibia nantes.

There are three ſpecies. 1. The oblong ſun-fiſh grows to a great bulk: one examined by Sylvianus was above 100 pounds in weight; and Dr Borlaſe mentions another taken at Plymouth in 1734, that weighed 500. In form it reſembles a bream or ſome deep fiſh cut off in the middle. The mouth is very ſmall, and contains in each jaw two broad teeth, with ſharp edges. The eyes are little; before each is a ſmall ſemilunar aperture; the pectoral fins are very ſmall, and placed behind them. The colour of the back is duſky, and dappled; the belly ſilvery: between the eyes and the pectoral fins are certain ſtreaks pointing downwards. The ſkin is free from ſcales.

When boiled, it has been obſerved to turn into a glutinous jelly, reſembling boiled ſtarch when cold, and ſerved the purpoſes of glue on being tried on paper and leather. The meat of this fiſh is uncommonly rank: it feeds on ſhell-fiſh.

There ſeems to be no ſatisfactory reaſon for the old Engliſh name. Care muſt be taken not to confound it with the ſun-fiſh of the Iriſh (ſee Squalus), which differs in all reſpects from this.

2. The mola, or ſhort ſun-fiſh, differs from the former, in being much ſhorter and deeper. The back and the anal fins are higher, and the aperture to the gills not ſemilunar, but oval. The ſituation of the fins are the ſame in both.

Both kinds are taken on the weſtern coaſts of this kingdom, but in much greater numbers in the warmer parts of Europe.—Mr Brunnich informs us, that between Antibes and Genoa he ſaw one of this ſpecies lie aſleep on the ſurface of the water: a ſailor jumped overboard and caught it.

See Plate CLXIV.

3. The levigatus, or globe, is common to Europe and South Carolina. As yet only a ſingle ſpecimen has been diſcovered in our ſeas; taken at Penzance in Cornwall. The length was one foot ſeven: the length of the belly, when diſtended, one foot; the whole circumference in that ſituation two feet ſix. The form of the body is uſually oblong; but when alarmed, it has the power of inflating the belly to a globular ſhape of great ſize. This ſeems deſigned as a means of defence againſt fiſh of prey: as they have leſs means of laying hold of it; and are beſides terrified by the numbers of ſpines with which that part is armed, and which are capable of being erected on every part. The mouth is ſmall: the irides white, tinged with red: the back from head to tail almoſt ſtraight, or at leaſt very ſlightly elevated; of a rich deep blue colour. It has the pectoral, but wants the ventral fins: the tail is almoſt even, divided by an angular projection in the middle; tail and fins brown. The belly and ſides are white, ſhagreened or wrinkled; and beſet with innumerable ſmall ſharp ſpines, adhering to the ſkin by four proceſſes.

DIODORUS, an hiſtorian, ſurnamed *Siculus*, becauſe he was born at Argyra in Sicily. He wrote an hiſtory of Egypt, Perſia, Syria, Media, Greece, Rome, and Carthage; and it is ſaid that he viſited all the places of which he has made mention in his hiſtory. It was the labour of 30 years. He is, however, too credulous in ſome of his narrations; and often wanders far from the truth. He often dwells too long upon fabulous reports and trifling incidents; while events of the greateſt importance to hiſtory are treated with brevity, and ſometimes paſſed over in ſilence. He lived in the age of J. Cæſar and Auguſtus; and ſpent much time at Rome to procure information, and authenticate his hiſtorical narrations. This important work, which he compoſed in Greek, contained 40 books, of which there are only 15 remaining. The ſtyle is clear and neat, and very ſuitable to hiſtory. The beſt edition is that of Amſterdam, 1743, in 2 vols folio.

DIOECIA, (from δις *twice*, and οικια a *houſe* or *habitation*) two houſes. The name of the 22d claſs in Linnæus's ſexual method, conſiſting of plants, which having no hermaphrodite flowers, produce male and female flowers on ſeparate roots. Theſe latter only ripen ſeeds; but require for that purpoſe, according to the ſexualiſts, the vicinity of a male plant; or the aſperſion, that is, ſprinkling, of the male duſt. From the ſeeds of the female flowers are raiſed both male and female plants. The plants then in the claſs diœcia are all male and female; not hermaphrodite, as in the greater number of claſſes; nor with male and female flowers upon one root, as in the claſs monœcia of the ſame author. See Botany, p. 430.

DIOGENES of Apollonia, in the iſland of Crete, held a conſiderable rank among the philoſophers who taught in Ionia before Socrates appeared at Athens. He was the ſcholar and ſucceſſor of Anaximenes, and in ſome meaſure rectified his maſter's opinion concerning air being the cauſe of all things. It is ſaid, that he was the firſt who obſerved that air was capable of condenſation and rarefaction. He paſſed for an excellent philoſopher, and died about the 450th year before the Chriſtian era.

Diogenes the Cynic, a famous philoſopher, was the ſon of a banker of Sinope in Pontus. Being baniſhed with his father for coining falſe money, he retired to Athens, where he ſtudied philoſophy under Antiſthenes. He added new degrees of auſterity to the ſect of the Cynics, and never did any philoſopher carry ſo far a contempt for the conveniences of life. He was one of thoſe extraordinary men who run every thing to extremity, without excepting even reaſon itſelf; and who confirm the ſaying, that “there is no great genius without a tincture of madneſs.” He lodged in a tub; and had no other moveables beſides his ſtaff, wallet, and wooden bowl, which laſt he threw away on ſeeing a boy drink out of the hollow of his hand. He uſed to call himſelf a vagabond, who had neither houſe nor country; was obliged to beg, was ill clothed, and lived from hand to mouth: and yet, ſays Ælian, he took as much pride in theſe things as Alexander could in the conqueſt of the world. He was not indeed a jot more humble than thoſe who are clothed in rich apparel, and fare ſumptuouſly every day. He looked down on all the world with ſcorn; he magiſterially cenſured all mankind, and thought himſelf unqueſtionably ſuperior to all other philoſophers. Alexander one day paid him a viſit, and made him an offer of riches or any thing elſe: but all that the philoſopher requeſted of him was, to ſtand from betwixt the ſun and him. As if he had ſaid, “Do not deprive me of the benefits of nature, and I leave to you thoſe of fortune.” The conqueror was ſo affected with the vigour and elevation of his ſoul, as to declare, that “if he was not Alexander, he would chooſe to be Diogenes:” that is, if he was not in poſſeſſion of all that was pompous and ſplendid in life, he would, like Diogenes, heroically deſpiſe it.

Diogenes had great preſence of mind, as appears from his ſmart ſayings and quick repartees; and Plato ſeems to have hit off his true character when he called him a Socrates run mad. He ſpent a great part of his life at Corinth, and the reaſon of his living there was as follows: As he was going over to the iſland of Ægina, he was taken by pirates, who carried him into Crete, and there expoſed him to ſale. He anſwered the crier, who aſked him what he could do, that "he knew how to command men:" and perceiving a Corinthian who was going by, he ſhowed him to the crier, and ſaid, "Sell me to that gentleman, for he wants a maſter." Xeniades, for that was the Corinthian's name, bought Diogenes, and carried him with him to Corinth. He appointed him tutor to his children, and entruſted him alſo with the management of his houſe. Diogenes's friends being deſirous of redeeming him, "You are fools, (ſaid he); the lions are not the ſlaves of thoſe who feed them, but they are the ſervants of the lions." He therefore plainly told Xeniades, that he ought to obey him, as people obey their governors and phyſicians. Some ſay, that Diogenes ſpent the remainder of his life in Xeniades's family; but Dion Chryſoſtom aſſerts that he paſſed the winter at Athens, and the ſummer at Corinth. He died at Corinth when he was about 90 years old: but authors are not agreed either as to the time or manner of his death. The following account, Jerom ſays, is the true one. As he was going to the Olympic games, a fever ſeized him in the way; upon which he lay down under a tree, and refuſed the aſſiſtance of thoſe who accompanied him, and who offered him either a horſe or a chariot. "Go you to the games, (ſays he), and leave me to contend with my illneſs. If I conquer, I will follow you: If I am conquered, I ſhall go to the ſhades below." He diſpatched himſelf that very night; ſaying, that "he did not ſo properly die, as get rid of his fever." He had for his diſciples Oneſicrites, Phocion, Stilpo of Megara, and ſeveral other great men. His works are loſt.

Diogenes Laertius, ſo called from Laerta in Cilicia where he was born, an ancient Greek author, who wrote ten books of the Lives of the Philoſophers, ſtill extant. In what age he flouriſhed, is not eaſy to determine. The oldeſt writers who mention him are Sopater Alexandrinus, who lived in the time of Conſtantine the Great, and Heſychius Mileſius, who lived under Juſtinian. Diogenes often ſpeaks in terms of approbation of Plutarch and Phavorinus; and therefore, as Plutarch lived under Trajan, and Phavorinus under Hadrian, it is certain that he could not flouriſh before the reigns of thoſe emperors. Menage has fixed him to the time of Severus; that is, about the year of Chriſt 200. From certain expreſſions in him ſome have fancied him to have been a Chriſtian; but, as Menage obſerves, the immoderate praiſes he beſtows upon Epicurus will not ſuffer us to believe this, but incline us rather to ſuppoſe that he was an Epicurean. He divided his Lives into books, and inſcribed them to a learned lady of the Platonic ſchool, as he himſelf intimates in his life of Plato. Montaigne was ſo fond of this author, that inſtead of one Laertius he wiſhes we had a dozen; and Voſſius ſays, that his work is as precious as gold. Without doubt we are greatly obliged to him for what we know of the ancient philoſophers; and if he had been as exact in the writing part, as he was judicious in the choice of his ſubject, we had been more obliged to him ſtill. Biſhop Burnet, in the preface to his Life of Sir Matthew Hale, ſpeaks of him in the following proper manner: "There is no book the ancients have left us (ſays he), which might have informed us more than Diogenes Laertius's Lives of the Philoſophers, if he had had the art of writing equal to that great ſubject which he undertook: for if he had given the world ſuch an account of them as Gaſſendus has done of Peireſc, how great a ſtock of knowledge might we have had, which by his unſkilfulneſs is in a great meaſure loſt? ſince we muſt now depend only on him, becauſe we have no other and better author who has written on that argument." There have been ſeveral editions of his Lives of the Philoſophers; but the beſt is that printed in two volumes 4to, at Amſterdam, 1693. This contains the advantages of all the former, beſides ſome peculiar to itſelf: the Greek text and the Latin verſion corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Caſaubons, and of Menage; 24 copper-plates of philoſophers elegantly engraved: to which is added, The Hiſtory of the Female Philoſophers, written by Menage, and dedicated to Madam Dacier. Beſides this, Laertius wrote a book of Epigrams upon illuſtrious Men, called Pammetrus, from its various kinds of metre: but this is not extant.

DIOMEDIA, in ornithology, a genus belonging to the order of anſeres. The bill is ſtrait; the ſuperior mandible is crooked at the point, and the lower one is truncated; the noſtrils are oval, open, a little prominent, and placed on the ſides. There are two ſpecies, viz. 1. The exulans, has pennated wings, and three toes on each foot. It is the albatroſs of Edwards; and is about the ſize of a pelican. Theſe birds are found in the ocean betwixt the tropics and at the Cape of Good Hope. They are alſo often ſeen in vaſt flocks in Kamtſchatka, and adjacent iſlands, about the end of June, where they are called *Great Gulls*; but it is chiefly in the bay of Penſchinenſi, the whole inner ſea of Kamtſchatka, the Kurile iſles, and that of Bering; for on the eaſtern coaſts of the firſt they are ſcarce, a ſingle ſtraggler only appearing now and then. Their chief motive for frequenting theſe places ſeems to be plenty of food; and their arrival is a ſure preſage of ſhoals of fiſh following. At their firſt coming they are very lean, but ſoon grow immenſely fat. Are very voracious birds, and will often ſwallow a ſalmon of four or five pounds weight; but as they cannot take the whole of it into their ſtomach at once, part of the tail end will often remain out of the mouth; and the natives, finding the bird in this ſituation, make no difficult matter of knocking it on the head on the ſpot. Before the middle of Auguſt they migrate elſewhere. They are often taken by means of a hook baited with a fiſh; but it is not for the ſake of their fleſh that they are valued, it being hard and unſavoury, but on account of the inteſtines, a particular part of which they blow up as a bladder, to ſerve as floats to buoy up their nets in fiſhing. Of the bones they make tobacco-pipes, needle-caſes, and other uſeful things. When caught they defend themſelves ſtoutly with the bill. Their cry is harſh and diſagreeable, not unlike the braying of an aſs. The breeding places of the albatroſs, if at all in the northern hemiſphere, have not yet been pointed out; but we are certain of their multiplying in the ſouthern, viz. Patagonia and Falkland iſlands: to this laſt place they come about the end of September or beginning of October, among other birds, in great abundance. The neſts are made on the ground with earth, are round in ſhape, a foot in height, indented at top. The egg larger than that of a gooſe, four inches and a half long, white, marked with dull ſpots at the bigger end; and is thought to be good food, the white never growing hard with boiling. While the female is ſitting, the male is conſtantly on the wing, and ſupplies her with food: during this time they are ſo tame as to ſuffer themſelves to be ſhoved off the neſt while their eggs are taken from them; but their chief deſtruction ariſes from the hawk, which, the moment the female gets off the neſt, darts thereon, and flies away with the egg. The albatroſs itſelf likewiſe has its enemy, being greatly perſecuted while on the wing by the dark grey gull called *ſkua*.

This bird attacks it on all ſides, but particularly endeavours to get beneath, which is only prevented by the firſt ſettling on the water; and indeed they do not frequently fly at a great diſtance from the ſurface, except obliged ſo to do by high winds or other cauſes. As ſoon as the young are able to remove from the neſt, the penguins take poſſeſſion, and hatch their young in turn. It is probable that they paſs from one part of the globe to another according to the ſeaſon; being now and then met with by different voyagers at various times in intermediate places. The food is ſuppoſed to be chiefly ſmall marine animals, eſpecially of the molluſcæ or blubber claſs, as well as flying fiſh. 2. The demerſa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the ſize of a gooſe, and is found at the Cape of Good Hope. It is an excellent ſwimmer and diver; but hops and flutters in a ſtrange aukward manner on the land, and, if hurried, ſtumbles perpetually, and frequently runs for ſome diſtance like a quadruped, making uſe of the wings inſtead of legs, till it can recover its upright poſture; crying out at the ſame time like a gooſe, but in a much hoarſer voice. It is ſaid to clamber ſome way up the rocks in order to make the neſt; in doing which, has been obſerved to aſſiſt with the bill. The eggs are two in number, white, as large as thoſe of a duck, and reckoned delicious eating, at leaſt are thought ſo at the Cape, where they are brought in great numbers for that purpoſe. At this place the birds are often ſeen kept tame; but in general they do not ſurvive the confinement many months.

DIOMEDES, ſon of Tydeus and Deiphyle, was king of Ætolia, and one of the braveſt of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulyſſes to ſteal the Palladium from the temple of Minerva in Troy; and aſſiſted in murdering Rheſus king of Thrace, and carrying away his horſes. At his return from the ſiege of Troy, he loſt his way in the darkneſs of night, and landed in Attica, where his companions plundered the country and loſt the Trojan Palladium. During his long abſence, his wife Ægiale forgot her marriage vows, and proſtituted herſelf to Cometes one of her ſervants. This laſciviouſneſs of the queen was attributed by ſome to the reſentment of Venus, whom Diomedes had ſeverely wounded in a battle before Troy. The infidelity of Ægiale was highly diſpleaſing to Diomedes. He reſolved to abandon his native country which was the ſeat of his diſgrace; and the attempts of his wife to take away his life, according to ſome accounts, did not a little contribute to haſten his departure. He came to that part of Italy which has been called *Magna Græcia*, where he built a city, which he called *Argyrippa*, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he periſhed by the hand of his father-in-law. His death was greatly lamented by his companions, who in the exceſs of their grief were changed into birds reſembling ſwans. Theſe birds took flight into a neighbouring iſland in the Adriatic, and became remarkable for the tameneſs with which they approached the Greeks, and for the horror with which they ſhunned all other nations. They are called the birds of Diomedes. Altars were raiſed to Diomedes, as to a god, one of which Strabo mentions at Timavus.

DION, a Syracuſan, ſon of Hipparinus, famous for his power and abilities. He was related to Dionyſius, and often adviſed him together with the philoſopher Plato, who at his requeſt had come to reſide at the tyrant's court, to lay aſide the ſupreme power. His great popularity rendered him odious in the eyes of the tyrants, who baniſhed him to Greece. There he collected a numerous force, and reſolved to free his country from tyranny. This he eaſily effected on account of his uncommon popularity. He entered the port of Syracuſe only in two ſhips; and in three days reduced under his power an empire which had already ſubſiſted for 50 years, and which was guarded by 500 ſhips of war, and above 100,000 troops. The tyrant fled to Corinth, and Dion kept the power in his own hands, fearful of the aſpiring ambition of ſome of the friends of Dionyſius: but he was ſhamefully betrayed and murdered by one of his familiar friends called *Callicrates*, or *Callippus*, 354 years before the Chriſtian era.

DION Cassius, a native of Nicæa in Bithynia. His father's name was Apronianus. He was raiſed to the greateſt offices of ſtate in the Roman empire by Pertinax, and his three ſucceſſors. He was naturally fond of ſtudy, and he improved himſelf by unwearied application. He was ten years in collecting materials for an hiſtory of Rome, which he made public in 80 books, after a laborious employment of 12 years in compoſing it. This valuable hiſtory began with the arrival of Æneas in Italy, down to the reign of the emperor Alexander Severus. The 34 firſt books are totally loſt, the 20 following, that is from the 35th to the 54th, remain entire, the ſix following are mutilated, and fragments is all that we poſſeſs of the laſt 20. In the compilation of this extenſive hiſtory, Dion propoſed himſelf Thucydides for a model, but he is not perfectly happy in his imitation. His ſtyle is pure and elegant, and his narrations are judiciouſly managed, and his reflections learned; but upon the whole, he is credulous, and the bigoted ſlave of partiality, ſatyr, and flattery. He inveighs againſt the republican principles of Brutus and Cicero, and extols the cauſe of Cæſar. Seneca is the object of his ſatyr, and he repreſents him as debauched and licentious in his morals.

DIONIS (Peter), a famous ſurgeon, born at Paris, diſtinguiſhed himſelf by his ſkill in his profeſſion, and by his works; the principal of which are, 1. A courſe of operations in ſurgery; 2. The anatomy of man; and, 3. A treatiſe on the manner of aſſiſting women in child-birth. He died in 1718.

DIONÆA MUSCIPULA, or *Venus's Fly-trap*, in botany, a newly diſcovered ſenſitive plant.

Every one ſkilled in natural hiſtory knows, that the mimoſæ, or ſenſitive plants, cloſe their leaves, and bend their joints, upon the leaſt touch: and this has aſtoniſhed us; but no end or deſign of nature has yet appeared to us from theſe ſurpriſing motions: they ſoon recover themſelves again, and their leaves are expanded as before. But the plant we are now going to deſcribe, ſhows that nature may have ſome view towards its nouriſhment, in forming the upper joint of its leaf like a machine to catch food: upon the middle of this lies the bait for the unhappy inſect that becomes its prey. Many minute red glands that cover its inner ſurface, and which perhaps diſcharge ſome ſweet liquor, tempt the poor animal to taſte them; and the inſtant theſe tender parts are irritated by its feet, the two lobes riſe up, graſp it faſt, lock the two rows of ſpines together, and ſqueeze it to death. And further, leſt the ſtrong efforts for life, in the creature thus taken, ſhould ſerve to diſengage it, three ſmall erect ſpines are fixed near the middle of each lobe among the glands, that effectually put an end to all its ſtruggles. Nor do the lobes ever open again, while the dead animal continues there. But it is nevertheleſs certain, that the plant cannot diſtinguiſh an animal from a mineral ſubſtance; for, if we introduce a ſtraw or a pin between the lobes, it will graſp it full as faſt as if it was an inſect.—The plant is one of the monogynia order, belonging to the decandria claſs. It grows in America, about 35 deg. N. Lat. in wet ſhady places, and flowers in July and Auguſt. The largeſt leaves are about three inches long, and an inch and half acroſs the lobes: the glands of thoſe expoſed to the ſun are of a beautiful red colour; but thoſe in the ſhade are pale, and inclining to green. The roots are ſquamous, ſending forth but few fibres, and are perennial. The leaves are numerous, inclining to bend downwards, and are placed in a circular order; they are jointed and ſucculent; the lower joint, which is a kind of ſtalk, is flat, longiſh, two-edged, and inclining to heart-ſhaped. In ſome varieties they are ſerrated on the edges near the top. The upper joint conſiſts of two lobes; each lobe is of a ſemi-oval form, with their margins furniſhed with ſtiff hairs like eye-brows, which embrace or lock in each other when they cloſe: this they do when they are inwardly irritated. The upper ſurfaces of theſe lobes are covered with ſmall red glands; each of which appears, when highly magnified, like a compreſſed arbutus berry.—Among the glands, about the middle of each lobe, are three very ſmall erect ſpines. When the lobes incloſe any ſubſtance, they never open again while it continues there. If it can be ſhoved out ſo as not to ſtrain the lobes, they expand again; but if force is uſed to open them, ſo ſtrong has nature formed the ſpring of their fibres, that one of the lobes will generally ſnap off rather than yield. The ſtalk is about ſix inches high, round, ſmooth, and without leaves; ending in a ſpike of flowers. The flowers are milk-white, and ſtand on footſtalks, at the bottom of which is a little painted bractea or flower-leaf. The ſoil in which it grows, as appears from what comes about the roots of the plants when they are brought over, is a black, light, mould, intermixed with white ſand, ſuch as is uſually found in our mooriſh heaths. Being a ſwamp plant, a north-eaſt aſpect will be propereſt for it at firſt, to keep it from the direct rays of the ſun; and in winter, till we are acquainted with what cold weather it can endure, it will be neceſſary to ſhelter it with a bell-glaſs, ſuch as is uſed for melons. This ſhould be covered with ſtraw or a mat in hard froſts. By this means ſeveral of theſe plants have been preſerved through the winter in a very vigorous ſtate. Its ſenſitive quality will be found in proportion to the heat of the weather, as well as the vigour of the plant. Our ſummers are not warm enough to ripen the ſeed; or poſſibly we are not yet ſufficiently acquainted with the culture of it. In order to try further experiments on its ſenſitive powers, ſome of the plants might be placed in pots of light mooriſh earth, and placed in pans of water, in an airy ſtove in ſummer; where the heat of ſuch a ſituation, being like that of its native country, will make it ſurpriſingly active.

DIONYSIA, in Grecian antiquity, ſolemnities in honour of Bacchus, ſometimes called by the general name of *Orgia*; and by the Romans *Bacchanalia*, and *Liberalia*. See BACCHANALIA and BACCHUS.

DIONYSIACA, in antiquity, was a deſignation given to plays and all manner of ſports acted on the ſtage; becauſe play-houſes were dedicated to Dionyſius, i. e. Bacchus and Venus, as being the deities of ſports and pleaſure.

DIONYSIAN PERIOD. See CHRONOLOGY, n° 31.

DIONYSIUS I. from a private ſecretary became general and tyrant of Syracuſe and all Sicily. He was likewiſe a poet; and having, by bribes, gained the tragedy-prize at Athens, he indulged himſelf ſo immoderately at table from exceſs of joy, that he died of the debauch, 386 B. C. but ſome authors relate that he was poiſoned by his phyſicians.

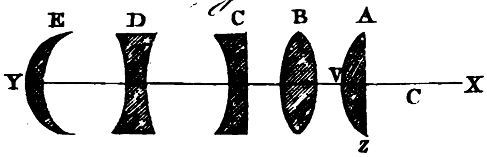
DIONYSIUS II. (his ſon and ſucceſſor) was a greater tyrant than his father: his ſubjects were obliged to apply to the Corinthians for ſuccour; and Timoleon their general having conquered the tyrant, he fled to Athens, where he was obliged to keep a ſchool for ſubſiſtence. He died 343 B. C.

DIONYSIUS (Halicarnaſſenſis), a celebrated hiſtorian, and one of the moſt judicious critics of antiquity, was born at Halicarnaſſus; and went to Rome after the battle of Actium, where he ſtaid 22 years under the reign of Auguſtus. He there compoſed in Greek his Hiſtory of the Roman Antiquities, in 20 books, of which the firſt 11 only are now remaining. There are alſo ſtill extant ſeveral of his critical works. The beſt edition of the works of this author is that of Oxford,

DIOPTRICS.

Plate CLXII.

Fig. 2.



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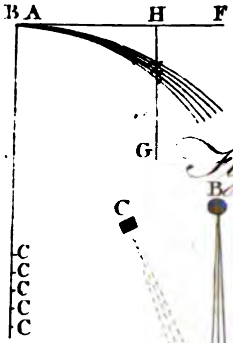


Fig. 1.

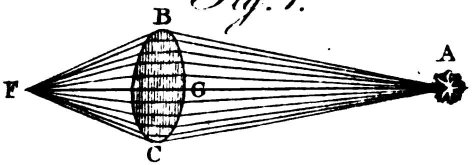


Fig. 6.

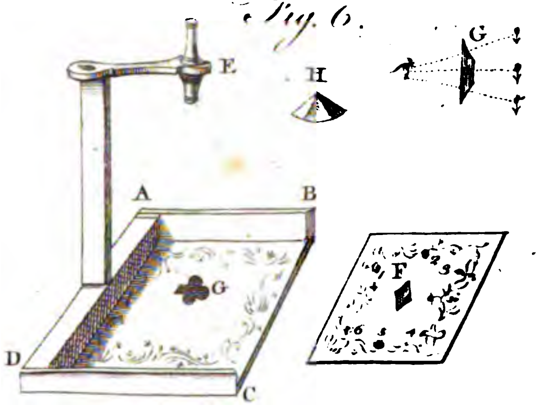


Fig. 5.

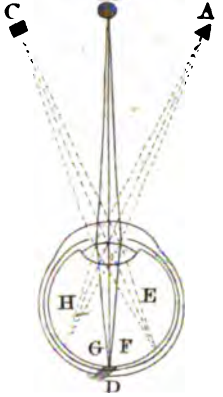


Fig. 4.

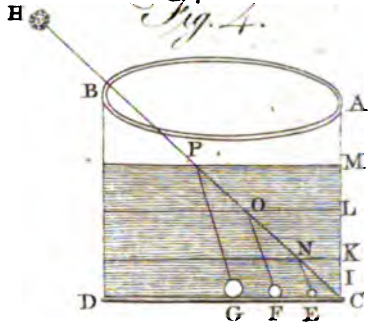


Fig. 8.

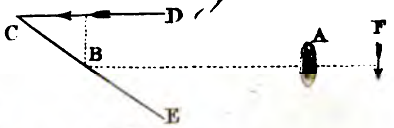


Fig. 10.

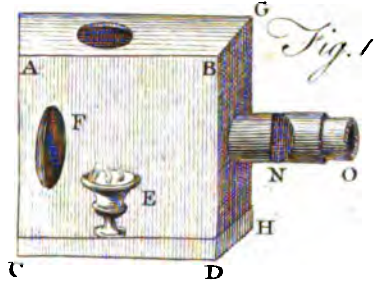


Fig. 7.

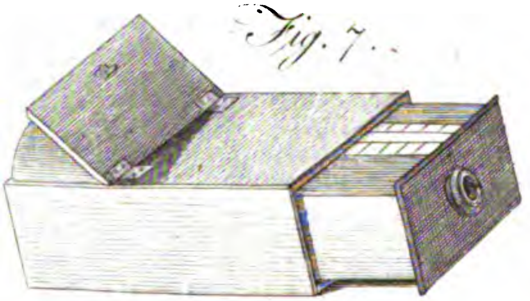


Fig. 9.

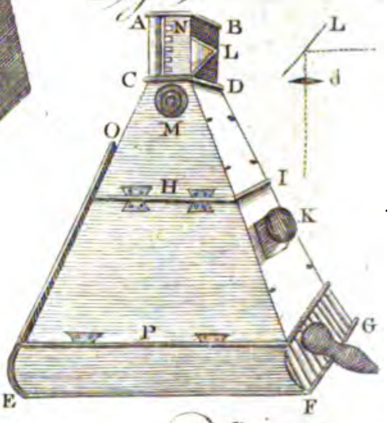


Fig. 11.

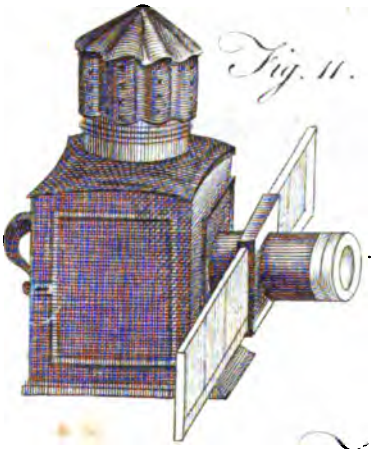


Fig. 14.

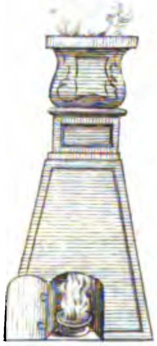


Fig. 16.

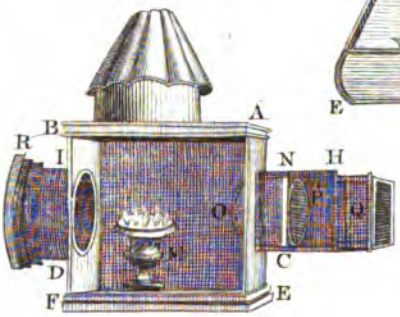


Fig. 3.

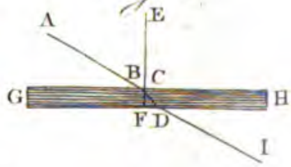


Fig. 12.

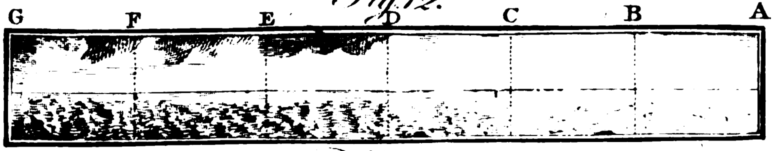


Fig. 13.

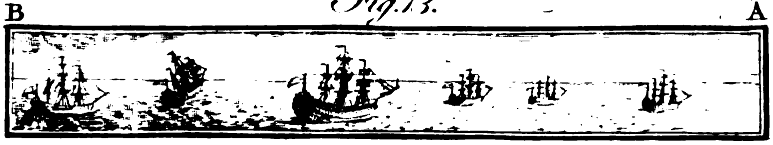
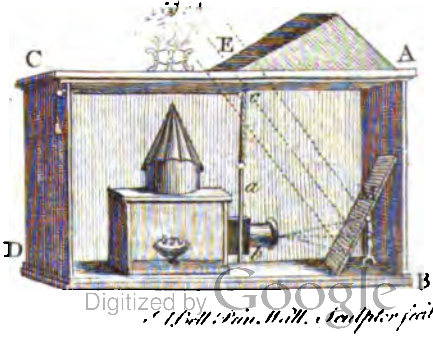


Fig. 15.



A. Bell Prin. Wall. Sculptor fecit.

Dionyſius, Diophantine.

Oxford, in 1704, in Greek and Latin, by Dr Hudſon.

Dionysius, a learned geographer, to whom is attributed a Periegeſis, or Survey of the Earth, in Greek verſe. Some ſuppoſe that he lived in the time of Auguſtus; but Scaliger and Saumaſius place him under the reign of Severus, or Marcus Aurelius. He wrote many other works, but his Periegeſis is the only one we have remaining; the beſt and moſt uſeful edition of which is that improved with notes and illuſtrations by Hill.

Dionysius (Areopagita), was born at Athens, and educated there. He went afterwards to Heliopolis in Epypt; where, if we may believe ſome writers of his life, he ſaw that wonderful eclipſe which happened at our Saviour's paſſion, and was urged by ſome extraordinary impulſe to cry out, *Aut Deus patitur, aut cum patiente dolet*; "either God himſelf ſuffers, or condoles with him who does." At his return to Athens he was elected into the court of Areopagus, from whence he derived his name of *Areopagite*. About the year 50 he embraced Chriſtianity; and, as ſome ſay, was appointed firſt biſhop of Athens by St Paul. Of his converſion we have an account in the 17th chapter of the Acts of the Apoſtles.—He is ſuppoſed to have ſuffered martyrdom; but whether under Domitian, Trajan, or Adrian, is not certain. We have nothing remaining under his name, but what there is the greateſt reaſon to believe ſpurious.

Dionysius (the Leſſer), a Scythian, became abbot of a monaſtery at Rome: he was the firſt who computed time from the birth of Dionyſius to Chriſt, and fixed that great event, according to the vulgar æra. He was alſo a learned canon-law writer, and died about the year 540.

Diophantine.

DIOPHANTINE PROBLEMS, in mathematics, certain queſtions relating to ſquare and cube numbers, and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were publiſhed with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with obſervations on every queſtion, by M. Fermat.

In theſe queſtions it is endeavoured to find commenſurable numbers to anſwer indeterminate problems; which bring out an infinite number of incommenſurable quantities. For example, it is propoſed to find a right-angled triangle, whoſe ſides x, y, z, are expreſſed by commenſurable numbers; it is known that $x^2+y^2=z^2$, z being the ſuppoſed hypothenuſe. But it is poſſible to aſſume x and y ſo, that z will be incommenſurable; for if $x=1$, and $y=2$, $z=\sqrt{5}$.

The art of reſolving ſuch problems conſiſts in ſo managing the unknown quantity or quantities in ſuch a manner, that the ſquare or higher power may vaniſh out of the equation, and then by means of the unknown quantity in its firſt dimenſion, the equation may be reſolved without having recourſe to incommenſurables; *e. gr.* let it be ſuppoſed to find x, y, z, the ſides of a right-angled triangle, ſuch as will give $x^2+y^2=z^2$. Suppoſe $z=x+u$, then $x^2+y^2=x^2+2xu+u^2$; out of which equation x^2 vaniſhes, and $x=\frac{y^2-u^2}{2u}$: then aſſuming y and u equal to any numbers at pleaſure, the ſides of the triangle will be $y, \frac{y^2-u^2}{2u}$, and the hypothenuſe $x+u=\frac{y^2+u^2}{2u}$; if $y=3$, and $u=1$, then $\frac{y^2-u^2}{2u}=4$, and $x+u=5$. It is evident that this problem admits of an infinite number of ſolutions.

For the reſolution of ſuch kind of problems, ſee Saunderſon's Algebra, vol. ii. book 6.

DIOPTRICS,

THAT part of Optics which treats of the laws of refraction, and the effects which the refraction of light has in viſion. The word is originally Greek, formed of δια *per*, "through," and ωπτομαι *I ſee*.

As this and the other branches of Optics are fully treated under the collective name, we ſhall here, 1. Juſt give a ſummary of the general principles of the branch, in a few plain aphoriſms, with ſome preliminary definitions; and, 2. Preſent our readers with a ſet of entertaining experiments illuſtrative of, or dependent upon, thoſe principles.

DEFINITIONS.

Plate CLXII. fig. 1.

1. When a ray of light paſſing out of one medium into another of a different denſity, is turned from that ſtraight line in which it would otherwiſe proceed into one of a different direction, it is ſaid to be refracted. Thus the rays AB, AC, &c by paſſing out of air into the glaſs BGC, are turned from their natural courſe into that of BF, CF, &c. and are therefore ſaid to be refracted by the lens BGC.

2. Any ſpherical tranſparent glaſs, that converges or diverges the rays of light as they paſs through it, is called a *lens*.

3. Of lenſes there are five ſorts: 1. A plane or ſingle convex lens, which is plane on one ſide and convex on the other; as AZ, fig. 3. 2. A double convex lens, as B. 3. A plano-concave lens, that is, plane on one ſide and concave on the other, as C. 4. A double concave, as D. And, 5. A meniſcus, which is convex on one ſide and concave on the other, as E.

Fig. 2.

4. The point C, round which the ſpherical ſurface of a lens, as AZ, is deſcribed, is called its *centre*; the line XY, drawn from that centre perpendicular to its two ſurfaces, is the axis; and the point V, to which the axis is drawn, is the vertex of that lens.

5. When the rays of light that paſs through a ſingle or double convex lens are brought into their ſmalleſt compaſs, that point is the focus of the lens.

6. In optical inſtruments, that lens which is next the object is called the *object-glaſs*; and that next the eye, the *eye-glaſs*.

Fig. 3.

7. The diſtance between the line AB and the perpendicular EF, is called the *angle of incidence*; and the diſtance between the line BD and the perpendicular EF, is called the *angle of refraction*.

APHORISMS.

Plate CLXII. Fig. 3. 1. A ray of light paſſing obliquely out of one medium into another that is denſer, will be refracted toward the perpendicular; as the ray AB, by paſſing out of air into glaſs, is refracted into BF, inclined to the perpendicular AF. On the contrary, a ray paſſing out of a denſer into a rarer medium, will be refracted from the perpendicular; as the ray BC, paſſing out of the glaſs GH into air, is refracted into DI.

2. The ſines of the angles of incidence and refraction, when the lines that contain them are all equal, will have a determinate proportion to each other, in the ſame mediums: which between air and water will be as 4 to 3; between air and glaſs, as 3 to 2, nearly; and in other mediums in proportion to their denſities.

3. Any object viewed through a glaſs, whoſe two ſurfaces are parallel, will appear of its natural ſhape and dimenſions, provided it be only of the ſize of the pupil of the eye, and the light proceeding from it be received directly through the glaſs by one eye only. In all other ſituations an alteration will be perceived not only in its apparent ſituation, but its dimenſions alſo. This alteration will be greater in proportion to the thickneſs of the glaſs, and the obliquity of the rays; in general, it is ſo ſmall as to be overlooked.

4. All the rays of light which fall upon a convex lens, whether parallel, converging, or diverging to a certain degree, will be made to meet in a focus on the other ſide; but if they diverge exceſſively, they will not do ſo. Thus if rays diverge from a point placed before the glaſs, at the focal diſtance from it, they will become parallel after paſſing through it; and if the point from which they proceed be nearer the glaſs than its focal diſtance, they will ſtill continue to diverge, though in a leſs degree than before.

5. When parallel rays fall upon a concave lens, they will be made to diverge after paſſing through it. If they are diverging already before they fall upon the glaſs, they will diverge more after paſſing through it; or even if they are converging to a certain degree, they will diverge upon paſſing through a concave lens; but if the convergence is very great, they will converge after paſſing through the glaſs, though to a more diſtant point than that at which they would otherwiſe have met.

6. When an object is viewed through two convex lenſes, its apparent diameter ought to be to its real one as the diſtance of the focus of the object-glaſs is to that of the eye-glaſs; but by reaſon of the aberration of the rays of light, the magnifying power will be ſomewhat greater or leſs in proportion to the diameter of the object.

By theſe aphoriſms we are enabled to account for the various effects of dioptric machines, as refracting teleſcopes, microſcopes, the camera obſcura, &c. See Optics.

ENTERTAINING EXPERIMENTS.

I. *Optical illuſions.*

Fig. 4. On the bottom of the veſſel ABCD, place three pieces of money, as a ſhilling, a half-crown, and crown; the firſt at E, the ſecond at F, and the laſt at G. Then place a perſon at H, where he can ſee no further into the veſſel than I: and tell him, that by pouring water into the veſſel you will make him ſee three different pieces of money; bidding him obſerve carefully whether any money goes in with the water. Plate CLXII.

Here you muſt obſerve to pour in the water very gently, or contrive to fix the pieces, that they may not move out of their places by its agitation.

When the water comes up to K, the piece at E will become viſible; when it comes up to L, the pieces at E and F will appear; and when it riſes to M, all the three pieces will be viſible.

From what has been ſaid of the refraction of light, the cauſe of this phenomenon will be evident: for while the veſſel is empty, the ray HI will naturally proceed in a ſtraight line: but in proportion as it becomes immerſed in water, it will be neceſſarily refracted into the ſeveral directions NE, OF, PG, and conſequently the ſeveral pieces muſt become viſible.

II. *Optical Augmentation.*

Take a large drinking glaſs of a conical figure, that is ſmall at bottom and wide at top; in which put a ſhilling, and fill the glaſs about half full with water: then place a plate on the top of it, and turn it quickly over, that the water may not get out. You will then ſee on the plate, a piece of the ſize of a half crown; and ſomewhat higher up, another piece of the ſize of a ſhilling.

This phenomenon ariſes from ſeeing the piece thro' the conical ſurface of the water at the ſide of the glaſs, and through the flat ſurface at the top of the water, at the ſame time: for the conical ſurface dilates the rays, and makes the piece appear larger; but by the flat ſurface the rays are only refracted, by which the piece is ſeen higher up in the glaſs, but ſtill of its natural ſize. That this is the cauſe will be further evident by filling the glaſs with water; for as the ſhilling cannot be then ſeen from the top, the large piece only will be viſible.

III. *Optical Subtraction.*

Against the wainſcot of a room fix three ſmall pieces of paper, as A, B, C, at the height of your eye; Fig. 5. and placing yourſelf directly before them, ſhut your right eye and look at them with the left; when you will ſee only two of thoſe papers, ſuppoſe A and B; but altering the poſition of your eye, you will then ſee the third and one of the firſt, ſuppoſe A; and by altering your poſition a ſecond time, you will ſee B and C; but never all three of them together.

The cauſe of this phenomenon is, that one of the three pencils of rays that come from theſe objects, falls conſtantly on the optic nerve at D; whereas to produce diſtinct viſion, it is neceſſary that the rays of light fall on ſome part of the retina E, F, G, H. We ſee by this experiment, one of the uſes of having two eyes; for he that has one only, can never ſee three objects placed in this poſition, nor all the parts of one object of the ſame extent, without altering the ſituation of his eye.

IV. *Alternate Illuſion.*

With a convex lens of about an inch focus, look

Plate CLXII. attentively at a ſilver ſeal, on which a cipher is engraved. It will at firſt appear cut in, as to the naked eye; but if you continue to obſerve it ſome time, without changing your ſituation, it will ſeem to be in relief, and the lights and ſhades will appear the ſame as they did before. If you regard it with the ſame attention ſtill longer, it will again appear to be engraved: and ſo on alternately.

If you look off the ſeal for a few moments, when you view it again, inſtead of ſeeing it, as at firſt, engraved, it will appear in relief. If, while you are turned toward the light, you ſuddenly incline the ſeal, while you continue to regard it, thoſe parts that ſeemed to be engraved will immediately appear in relief: and if, when you are regarding theſe ſeeming prominent parts, you turn yourſelf ſo that the light may fall on the right hand, you will ſee the ſhadows on the ſame ſide from whence the light comes, which will appear not a little extraordinary. In like manner the ſhadows will appear on the left, if the light fall on that ſide. If, inſtead of a ſeal, you look at a piece of money, theſe alterations will not be viſible, in whatever ſituation you place yourſelf.

It has been ſuſpected that this illuſion ariſes from the ſituation of the light: and in fact, "I have obſerved (ſays M. Guyot, from whom this article is taken), that when I have viewed it with a candle on the right, it has appeared engraved; but by changing the light to the left ſide, it has immediately appeared in relief." It ſtill, however, remains to be explained, why we ſee it alternately hollow and prominent, without changing either the ſituation or the light. Perhaps it is in the ſight itſelf that we muſt look for the cauſe of this phenomenon; and this ſeems the more probable, as all theſe appearances are not diſcernible by all perſons.

Mr William Jones of Holborn, has remarked to us, that this illuſion is ſtill more extraordinary and permanent, when you look at a cavity in a ſeal or other object through the three eye-glaſſes of a common four glaſs refracting teleſcope: all cavities viewed thro' theſe glaſſes appear conſtantly reliefs, in almoſt all ſituations of the light you ſee them with.

V. *The Dioptrical Paradox.*

A new and curious optical, or what may be called properly a *dioptrical*, deception, has been made by Mr W. Jones. Its effect is, that a print, or an ornamented drawing, with any object, ſuch as an *ace of diamonds*, &c. in the centre F, will be ſeen as the *ace of clubs* when it is placed in the machine ABDC, and viewed through a ſingle glaſs only contained in the tube E. Fig. 6. The conſtruction of this machine is truly ſimple. Plate CLXII. The glaſs in the tube F, which brings about this ſurpriſing change, is ſomewhat on the principle of the common multiplying glaſs, as repreſented at G, which by the number of its inclined ſurfaces, and from the refractive power of the rays proceeding from the objects placed before it, ſhows it in a multiplied ſtate or quantity. Its only difference is, that the ſides of this glaſs are flat, and diverge upwards from the baſe to a point in the axis of the glaſs like a cone: the number of the ſides is ſix; and each ſide, from its angular poſition to the eye, has the property of refracting from the border of the print F ſuch a portion of it (deſignedly there placed), as will make a part in the compoſition of the figure to be repreſented: for the hexagonal and conical figure of this glaſs prevents any ſight of the ace of diamonds in the centre being ſeen; conſequently the ace of clubs being previouſly and mechanically drawn in the circle of refraction in ſix different parts of the border, at 1, 2, 3, 4, 5, 6, and artfully diſguiſed in the ornamental border by blending them with it, the glaſs in the tube at E will change the appearance of the ace of diamonds F into the ace of clubs G. In the ſame manner may other prints undergo ſimilar changes, according to the will of an ingenious draughtſman who may deſign them. The figure of the glaſs is clearly ſhown at H.

VI. *The Camera Obſcura, or Dark Chamber.*

Make a circular hole in the ſhutter of a window, from whence there is a proſpect of the fields, or any other object not too near; and in this hole place a convex glaſs, either double or ſingle, whoſe focus is at the diſtance of five or ſix feet (A). Take care that no light enter the room but by this glaſs: at a diſtance from it, equal to that of its focus, place a paſteboard, covered with the whiteſt paper; which ſhould have a black border, to prevent any of the ſide rays from diſturbing the picture. Let it be two feet and a half long, and 18 or 20 inches high: bend the length of it inwards, to the form of part of a circle, whoſe diameter is equal to double the focal diſtance of the glaſs. Then fix it on a frame of the ſame figure, and put it on a moveable foot, that it may be eaſily fixed at that exact diſtance from the glaſs where the objects paint themſelves to the greateſt perfection. When it is thus placed, all the objects that are in the front of the window will be painted on the paper, in an inverted poſition (B), with the greateſt regularity and in the moſt natural colours.

(A) The diſtance ſhould not be leſs than three feet; for if it be, the images will be too ſmall, and there will not be ſufficient room for the ſpectators to ſtand conveniently. On the other hand, the focus ſhould never be more than 15 or 20 feet, for then the images will be obſcure, and the colouring faint. The beſt diſtance is from 6 to 12 feet.

(B) This inverted poſition of the images may be deemed an imperfection, but it is eaſily remedied: for if you ſtand above the board on which they are received, and look down on it, they will appear in their natural poſition: or if you ſtand before it, and, placing a common mirror againſt your breaſt in an oblique direction, look down in it, you will there ſee the images erect, and they will receive an additional luſtre from the reflection of the glaſs; or place two lenſes, in a tube that draws out; or, laſtly, if you place a large concave mirror at a proper diſtance before the picture, it will appear before the mirror, in the air, and in an erect poſition.

If you place a moveable mirror without the window; by turning it more or leſs, you will have on the paper all the objects that are on each ſide of the window (c).

If inſtead of placing the mirror without the window you place it in the room, and above the hole (which muſt then be made near the top of the ſhutter), you may receive the repreſentation on a paper placed horizontally on a table; and draw, at your leiſure, all the objects that are there painted.

Nothing can be more pleaſing than this experiment, eſpecially when the objects are ſtrongly enlightened by the ſun: and not only land-proſpects, but a ſea-port, when the water is ſomewhat agitated, or at the ſetting of the ſun, preſents a very delightful appearance.

This repreſentation affords the moſt perfect model for painters, as well for the tone of colours, as that degradation of ſhades, occaſioned by the interpoſition of the air, which has been ſo juſtly expreſſed by ſome modern painters.

It is neceſſary that the paper have a circular form; for otherwiſe, when the centre of it was in the focus of the glaſs, the two ſides would be beyond it, and conſequently the images would be confuſed. If the frame were contrived of a ſpherical figure, and the glaſs were in its centre, the repreſentation would be ſtill more accurate. If the object without be at the diſtance of twice the focal length of the glaſs, the image in the room will be of the ſame magnitude with the object.

The lights, ſhades, and colours, in the camera obſcura, appear not only juſt, but, by the images being reduced to a ſmaller compaſs, much ſtronger than in nature. Add to this, that theſe pictures exceed all others, by repreſenting the motion of the ſeveral objects: thus we ſee the animals walk, run, or fly; the clouds float in the air; the leaves quiver; the waves roll, &c.; and all in ſtrict conformity to the laws of nature. The beſt ſituation for a dark chamber is directly north, and the beſt time of the day is noon.

VII. *To ſhow the Spots on the Sun's Diſk, by its Image in the Camera Obſcura.*

Put the object-glaſs of a 10 or 12 feet teleſcope into the ſcioptric ball, and turn it about till it be directly oppoſite to the ſun (d). Then place the paſteboard, mentioned in the laſt experiment, in the focus of the lens; and you will ſee a clear bright image of the ſun, of about an inch diameter, in which the ſpots on the ſun's ſurface will be exactly deſcribed.

As this image is too bright to be ſeen with pleaſure by the naked eye, you may view it through a lens whoſe focus is at ſix or eight inches diſtance; which at the ſame time that it prevents the light from being offenſive, will, by magnifying both the image and the ſpots, make them appear to greater advantage.

VIII. *To magnify ſmall Objects by means of the Sun's Rays let into a Dark Chamber.*

Let the rays of light that paſs through the lens in the ſhutter be thrown on a large concave mirror, properly fixed in a frame. Then take a ſlip or thin plate of glaſs; and ſticking any ſmall object on it, hold it in the incident rays, at a little more than the focal diſtance from the mirror: and you will ſee, on the oppoſite wall, amidſt the reflected rays, the image of that object, very large, and extremely clear and bright. This experiment never fails to give the ſpectator the higheſt ſatisfaction.

IX. *The Portable Camera Obſcura.*

The great pleaſure produced by the camera obſcura in the common form, has excited ſeveral to render it more univerſally uſeful by making it portable; eaſily fixed on any ſpot, and adapted to every proſpect. We ſhall not here examine the merits of the various ſorts that have been invented; but content ourſelves with deſcribing two of late improved conſtructions, as made and ſold by the opticians of the preſent time, and that appear in their conſtruction the moſt convenient and advantageous of any yet contrived.

Fig. 7.

Fig. 8.

The pocket or portable camera obſcura, with a drawer to draw out in the front, is repreſented in fig. 7. The images of the objects before the inſtrument are reflected upon a glaſs ground rough on its upper ſide, and that is placed at top of the hinder part of the box, under the moveable cover repreſented in the figure. The images repreſented thereon will afford a moſt beautiful and perfect piece of perſpective or landſcape of whatever is before the camera, and more particularly ſo if the ſun ſhines upon the objects. The outlines of them may eaſily be traced on the glaſs by a black-lead pencil. There is ſometimes a ſcale of proportions placed in the upper ſurface of the drawer, by which any particular building or other object may be drawn in a given proportion or magnitude, and according to the figures inſerted on the ſcale, which are adapted to the focus or foci of the lenſes made uſe of in the camera. The glaſſes that are made uſe of in this camera are only three, and are repreſented in fig. 8. The convex glaſs A is placed in the front of the drawer of the camera, and is of a focus agreeable to the length of the box. The mirror CE reclines in the box in an angle of 45 degrees from a perpendicular ſituation. The rays flowing from the object F through the convex glaſs A to the plane mirror CE, will be reflected from it, and meet in points on the glaſs placed horizontally in the direction CD; and will form thereon the aforementioned images. If on this glaſs an oiled paper or any other tranſparent ſubſtance be placed, the images will be clearly repreſented, and ſufficiently ſo to delineate them by a black-lead pencil or crayon. Inſtead of the glaſs CD, or ſometimes underneath it, is often placed a double convex lens of a focus ſomewhat ſhorter than the length of the box: this alteration conſiderably brightens the appearance of the images, and renders them as vivid as the objects themſelves, though not quite ſo accurate in their contours or outlines as by the preceding method.

(c) There is another method of making the dark chamber; which is by a ſcioptric ball, that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round. The frame is fixed to the hole in the ſhutter; and the ball, by turning about, anſwers, in great part, the uſe of the mirror on the outſide of the window. If the hole in the window be no bigger than a pea, the objects will be repreſented without any lens, though by no means ſo diſtinctly, or with ſuch vivid colours.

(d) When the ſun is directly oppoſite to the hole, the lens will itſelf be ſufficient: or by means of the mirror on the outſide of the window, as in Experiment VI. the lens will anſwer the purpoſe at any time.

Fig. 9.

Another kind of portable camera obſcura is, where the images are formed upon white paper, and the ſeveral parts of the camera fold up out of a box ſhaped like a book or cheſt. This way of the images being formed on paper is a much preferable one to the preceding method, and admits of their being traced on the paper with the utmoſt readineſs. This inſtrument, as open out of its caſe and ready for uſe, is repreſented in fig. 9. The front and ſides fold up to the height of about two feet from the caſe EFG, by means of hinges placed at P, H, &c. The head ABCD, about five inches ſquare and high, containing the mirror L and the convex lens beneath it, fits on at CD, and the inner ſquare tube of it is moved up and down by rack-work and a pinion NM. This motion ſerves to adjuſt the convex lens *d* to its proper focal diſtance from the white paper placed within ſide at the bottom of the box EFG, ſo that the images may be formed with the greateſt poſſible diſtinctneſs. In tracing theſe images the face is applied cloſe to the hole in the front at K, and the hand in the ſleeve in the front at the bottom of FG. When the ſides and front are unhooked and folded down, they all lie cloſe in the box EFG, and the lid O folds down as a top on them cloſe, and the box remains then the ſize of a common folio book, and is covered with calf leather and lettered on the back in perfect imitation of one.

By the diagonal poſition of a plane mirror the curious opera-glaſs is conſtructed, by which any perſon may be viewed in a theatre or public company, and yet know nothing of it. It conſiſts only in placing a concave glaſs near the plane mirror, in the end of a ſhort round tube, and a convex glaſs in a hole in the ſide of the tube. Then holding the end of the tube with the glaſs to the eye, all objects next to the hole in the ſide will be reflected ſo as to appear in a direct line forward, or in a poſition at right angles to the perſon's ſituation who is looked at. Plane glaſſes inſtead of a concave and convex may be uſed; but in this caſe there will be no magnitude of the object, but it will appear brighter. It is called by opticians the *diagonal opera-glaſs*.

X. *The Magic Lantern.*

THIS very remarkable machine, which is now known over all the world, cauſed great aſtoniſhment at its origin. It is ſtill beheld with pleaſing admiration; and the ſpectator very frequently contents himſelf with wondering at its effects, without endeavouring to inveſtigate their cauſe. The invention of this ingenious illuſion is attributed to the celebrated P. Kercher, who has publiſhed on various ſciences, works equally learned, curious, and entertaining. Its deſign is to repreſent at large, on a cloth or board, placed in the dark, the images of ſmall objects, painted with tranſparent colours on plates of glaſs.

Fig. 10.

The conſtruction is as follows. Let ABCD be the ſide of a tin box, eight inches high, eight inches long, and ten broad (or any other ſimilar dimenſions), the top of which muſt have a funnel, with a cover, as repreſented in fig. 11; which at the ſame time it gives a paſſage to the ſmoke, prevents the light from coming out of the box. In the middle of the bottom of the box muſt be placed a low tin lamp E, which is to be moveable. It ſhould have three or four lights, that muſt be at the height of the centre of the glaſſes in the tubes N and O. In the largeſt of theſe tubes muſt be placed a glaſs ſemiglobular lens N, about four inches diameter; and in the ſmaller one a double convex lens o, about 2½ inches diameter, and ſix inches focus, the length of the tubes holding them about 4½ inches each: the inner tube containing the ſmall lens o muſt be a ſliding one, in order to adjuſt it at a proper diſtance from the painted ſliders, ſo that the objects thereon may be diſtinctly repreſented on the cloth or white wall. A ſlit or opening between the glaſs N and the front ſide BGDH of the box muſt be made large enough to admit the ſliders to be paſſed through, (as in fig. 11.) The clearneſs of the light, and the objects upon the cloth, will depend much upon the light of the lamp: it will therefore be proved beſt, to place, inſtead of the common lamp E, a kind of the new or Argant's Patent Lamp, which will be found conſiderably to improve the effect of the lantern by its ſuperior ſtrength of light.

From the conſtruction of this lantern it is evident, that when the glaſs ſliders, with the painted figures, are placed in the groove or ſlit in the lantern for that purpoſe, and the room darkened, a quantity of light from the lamp at E will be collected by the lens N, and refracted upon the cloth placed oppoſite; and that by moving the ſliding tube containing the ſmall lens o gradually in or out as occaſion may require, this lens will form images of the figures on the ſliders in their diſtinct colours and proportions, with the appearance of life itſelf, and of any ſize from ſix inches to 7 feet, according to the diſtance of the lantern from the cloth. The lantern, with one of the ſliders ready for uſe, is clearly repreſented in fig. 11. By the aid of the new patent lamp aforementioned, conſiderable uſeful improvements are made to this lantern. Mr Jones optician of Holborn has contrived an apparatus to be applied to it, that converts it into a microſcope by night; and it ſhows all the variety of tranſparent and many of the opaque objects magnified upon a cloth or ſkreen oppoſite, ſimilar to the figures above mentioned, but not in ſo large a degree; about one or two feet diameter is the utmoſt that can at preſent be obtained.

Method of Painting the Glaſſes for the Lantern. Draw on a paper the ſubject you deſire to paint, and fix it at each end to the glaſs. Provide a varniſh with which you have mixed ſome black paint; and with a fine pencil draw on the other ſide of the glaſs, with very light touches, the deſign drawn on the paper. If you are deſirous of making the painting as perfect as poſſible, you ſhould draw ſome of the outlines in their proper colours, provided they are the ſtrongeſt tints of theſe colours that are uſed. When the outlines are dry, you colour the figures with their proper tints or degradations. Tranſparent colours are moſt proper for this purpoſe, ſuch as carmine, lake, Pruſſian blue, verdigris, &c. and theſe muſt be tempered with a ſtrong white varniſh, to prevent their peeling off. You are then to ſhade them with black mixed with the ſame varniſh, or with biſtre, as you find convenient. You may alſo leave ſtrong lights in ſome parts, without any colours, in order to produce a more ſtriking effect. Obſerve, in particular, not to uſe more than four or five colours, ſuch as blue, red, green, and yellow. You ſhould employ, however, a great variety of tints, to give your painting a more natural air; without which they will repreſent vulgar objects, which are by no means the more pleaſing becauſe they are gawdy.

When the lamp in this lantern is lighted, and, by drawing out the tube to a proper length, the figures painted on the glaſs appear bright and well defined, the ſpectator cannot fail of being highly entertained by the ſucceſſion of natural or groteſque figures that are painted on the glaſſes. This piece of optics may be rendered much more amuſing, and at the ſame time more marvellous, by preparing figures to which different natural motions may be given (E), which every one may perform according to his own taſte; either by movements in the figures themſelves, or by painting the ſubject on two glaſſes, and paſſing them at the ſame time through the groove, as will be ſeen in the next experiment.

XI. *To repreſent a Tempeſt by the Magic Lantern.*

PROVIDE two plates of glaſs, whoſe frames are ſo thin that they may both paſs freely through the ſlit or groove of the common magic lanterns at the ſame time.

Fig. 12.

On one of theſe glaſſes you are to paint the appearance of the ſea, from the ſlighteſt agitation to the moſt violent commotion. Repreſenting from A to B a calm; from B to C a ſmall agitation, with ſome clouds; and ſo on to F and G, which ſhould exhibit a furious ſtorm. Obſerve, that theſe repreſentations are not to be diſtinct, but run into each other, that they may form a natural gradation: remember alſo, that great part of the effect depends on the perfection of the painting, and the pictureſque appearance of the deſign.

Fig. 13.

On the other glaſs you are to paint veſſels of different forms and dimenſions, and in different directions, together with the appearance of clouds in the tempeſtuous parts.

You are then to paſs the glaſs ſlowly through the groove; and when you come to that part where the ſtorm begins, you are to move the glaſs gently up and down, which will give it the appearance of a ſea that begins to be agitated: and ſo increaſe the motion till you come to the height of the ſtorm. At the ſame time you are to introduce the other glaſs with the ſhips, and moving that in like manner, you will have a natural repreſentation of the ſea, and of ſhips in a calm and in a ſtorm. As you draw the glaſſes ſlowly back, the tempeſt will ſeem to ſubſide, the ſky grow clear, and the ſhips glide gently over the waves.—By means of two glaſſes diſpoſed in this manner you may likewiſe repreſent a battle, or ſea-fight, and numberleſs other ſubjects, that every one will contrive according to his own taſte. They may alſo be made to repreſent ſome remarkable or ludicrous action between different perſons, and many other amuſements that a lively imagination will eaſily ſuggeſt.

XII. *The Nebulous Magic Lantern.*

THE light of the magic lantern, and the colour of images, may not only be painted on a cloth, but alſo reflected by a cloud of ſmoke.

Provide a box of wood or paſteboard (fig. 14.) of about four feet high, and of ſeven or eight inches ſquare at bottom, but diminiſhing as it aſcends, ſo that its aperture at top is but ſix inches long, and half an inch wide. At the bottom of this box there muſt be a door that ſhuts quite cloſe, by which you are to place in the box a chafing-diſh with hot coals, on which is to be thrown incenſe, whoſe ſmoke goes out in a cloud at the top of the box. It is on this cloud that you are to throw the light that comes out of the lantern, and which you bring into a ſmaller compaſs by drawing out the moveable tube. The common figures will here ſerve. It is remarkable in this repreſentation, that the motion of the ſmoke does not at all change the figures; which appear ſo conſpicuous, that the ſpectator thinks he can graſp them with his hand.

Fig. 14.

Note, In this experiment ſome of the rays paſſing through the ſmoke, the repreſentation will be much leſs vivid than on the cloth; and if care be not taken to reduce the light to its ſmalleſt focus, it will be ſtill more imperfect.

XIII. *To produce the Appearance of a Phantom upon a Pedeſtal placed on the middle of a Table.*

Fig. 15.

INCLOSE a common ſmall magic lantern* in a box A B C D, that is large enough to contain alſo an inclined mirror M; which muſt be moveable, that it may reflect the cone of light thrown on it by the lantern, in ſuch a manner that it may paſs out at the aperture made in the top of the box. There ſhould be a flap with hinges to cover the opening, that the inſide of the box may not be ſeen when the experiment is making. This aperture ſhould likewiſe be oval, and of a ſize adapted to the cone of light that is to paſs thro' it. There muſt be holes made in that part of the box which is over the lantern, to let out the ſmoke; and over that part muſt be placed a chafing-diſh of an oblong figure, and large enough to hold ſeveral lighted coals. This chafing-diſh may be incloſed in a painted tin box of about a foot high, and with an aperture at top ſomething like fig. 14. It ſhould ſtand on four ſhort feet, to give room for the ſmoke of the lamp to paſs out. There muſt alſo be a glaſs that will aſcend and deſcend at pleaſure in a vertical groove *ab*. To this glaſs let there be fixed a cord, that, going over a pulley

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(E) There are in the Philoſophical Eſſays of M. Muſchenbroek, different methods of performing all theſe various movements, by ſome mechanical contrivances that are not difficult to execute.

Plate CLXII. ley *c*, paſſes out of the box at the ſide CD, by which the glaſs may be drawn up, and will deſcend by its own weight. On this glaſs may be painted a ſpectre, or any other more pleaſing figure. Obſerve that the figures muſt be contracted in drawing, as the cloud of ſmoke does not cut the cone of light at right angles, and therefore the figures will appear longer than they do on the glaſs.

After you have lighted the lamp in the lantern, and put the miror in a proper direction, you place the box or pedeſtal ABCD on a table; and putting the chafing-diſh in it, throw ſome incenſe in powder on the coals. You then open a trap-door, and let down the glaſs ſlowly; and when you perceive the ſmoke diminiſh you draw up the glaſs, that the figure may diſappear, and ſhut the trap-door. This appearance will occaſion no ſmall ſurpriſe, as the ſpectre will ſeem to riſe gradually out of the pedeſtal, and on drawing up the glaſs will diſappear in an inſtant. Obſerve, that when you exhibit this experiment, you muſt put out all the lights in the room; and the box ſhould be placed on a high table, that the ſpectators may not perceive the aperture by which the light comes out. Tho' we have mentioned a ſmall magic lantern, yet the whole apparatus may be ſo enlarged, that the phantom may appear of a formidable ſize.

XIV. *The Magic Theatre.*

By making ſome few additions to the magic lantern with the ſquare tube, uſed in Experiment X. various ſcenes, characters, and decorations of a theatre may be repreſented in a lively manner. In this experiment it is quite neceſſary to make the lantern much larger than common, that the objects painted on the glaſſes, being of a larger ſize, may be repreſented with greater preciſion, and conſequently their ſeveral characters more ſtrongly marked.

Fig. 16. Let there be made a wooden box ABCD, a foot and a half long, 15 inches high, and 10 wide. Let it be placed on a ſtand EF, that muſt go round it, and by which it may be fixed with two ſcrews to a table. Place over it a tin cover, as in the common lantern. Make an opening in its two narroweſt ſides; in one of which place the tube H, and in the other the tube I: let each of them be ſix inches wide, and five inches high: in each of theſe tubes place another that is moveable, in order to bring the glaſſes, or concave mirror, that are contained in them, to a proper diſtance. In the middle of the bottom of this box place a tin lamp M; which muſt be moveable in a groove, that it may be placed at a proper diſtance with regard to the glaſſes and mirror: this lamp ſhould have five or ſix lights, each of them about an inch long. At the beginning of the tube H, toward the part N, make an opening of an inch wide, which muſt croſs it laterally: another of three quarters of an inch, that muſt croſs it vertically, and be nearer the box than the firſt; and a third of half an inch, that muſt be before the firſt. The opening made laterally muſt have three or four grooves, the ſecond two, and the third one: that different ſubjects of figures and decorations may be paſſed, either ſidewiſe, aſcending or deſcending, ſo that the ſcenes of a theatre may be the more exactly imitated (F). Incloſe theſe grooves between two convex rectangular glaſſes, of ſix inches long, and five inches high, and of about 20 inches focus; one of which muſt be placed at O, and the other toward P. Have another tube Q, of about a foot long, which muſt enter that marked H; and at its outward extremity place a lens of about 15 inches focus. There muſt alſo be a third tube R, four inches long, into which that marked I is to enter: to the exterior end of this adjuſt a concave mirror, whoſe focus muſt be at ſeven or eight inches from its reflecting ſurface. Plate CLXII.

The magic lantern being thus adjuſted, nothing more is neceſſary than to provide glaſſes, painted with ſuch ſubjects as you would repreſent, according to the grooves they are to enter. The lamp is then to be lighted; and placing a glaſs in one of the grooves, you draw out the moveable tubes till the object paints itſelf on a cloth to the moſt advantage: by which you determine the diſtance of the lantern and the ſize of the image. You then make a hole in the partition of that ſize, and fix in it a plate of clear glaſs, over which you paſte a very thin paper, which muſt be varniſhed, that it may be as tranſparent as poſſible.

On this paper are to be exhibited the images of all thoſe objects, that, by paſſing ſucceſſively through the grooves, are to repreſent a theatric entertainment. The exhibition will be very agreeable; becauſe the magic lantern being concealed behind the partition, the cauſe of the illuſion cannot by any means be diſcovered.

In order to ſhow more clearly in what manner a ſubject of this ſort ſhould be painted, and the glaſſes diſpoſed, we will here make choice of the ſiege of Troy for a theatric ſubject; in which will be found all the incidents neceſſary to the exhibition of any other ſubject whatever.—In the firſt act, the theatre may repreſent, on one ſide, the ramparts of Troy; toward the back-part, the Grecian camp; and at a further diſtance, the ſea, and the iſle of Tenedos. We will ſuppoſe the time to be that when the Greeks feigned to raiſe the ſiege; and embarked, leaving behind them the wooden horſe, in which were contained the Grecian ſoldiers.—On a glaſs, therefore, of the ſame width with the aperture made in the ſide AC of the box, you are to paint a deep blue curtain, lightly charged with ornaments, quite tranſparent. This glaſs is to be placed in the firſt vertical groove; ſo that by letting it gently down, its image may appear to riſe in the ſame manner as the curtain of a theatre. All the glaſſes that are to aſcend or deſcend muſt be bordered with thin pieces of wood, and ſo exactly fill the grooves, that they may not ſlide down of themſelves.—You muſt have ſeveral glaſſes of a proper ſize to paſs through the horizontal grooves, and of different lengths according to the extent of the ſubject. You may paint, on the firſt, the walls of Troy. On the ſecond, the Grecian camp. On the third, the ſea, the iſle of Tenedos, and a ſerene ſky. On the fourth, the Grecian troops

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(F) In the decorations, the clouds and the palaces of the gods ſhould deſcend; caves and inferna palaces ſhould aſcend; earthly palaces, gardens, &c. enter at the ſides.

Plate CLXII.

troops by detached figures. On the fifth, other troops, diſpoſed in battalions, and placed at a diſtance. On the ſixth, divers veſſels, which as the glaſs advances in the groove diminiſh in ſize. On the ſeventh, the wooden horſe and Sinon. On the eighth, Trojan men and women.

Theſe glaſſes being properly painted, you place in the horizontal grooves the firſt, ſecond, third, and fourth. Then draw up the curtain, by letting down the glaſs on which it is painted, and draw away gently the fourth glaſs, and after that the ſecond; then advance very gently the fifth, that repreſents the embarkment, and paſs it quite through. Next paſs, the oppoſite way, the ſixth, which repreſents the Grecian fleet. The objects painted on the fourth, fifth, and ſixth, quite diſappearing, you are to advance the ſeventh, on which is painted the wooden horſe; and at the ſame time the eighth, where the Trojans will appear to draw the horſe into the city. The curtain is then to be let down, that you may withdraw the ſcenes of the firſt act, and place in the grooves thoſe that are to compoſe the ſecond.—In the ſecond act may be repreſented the interior part of the city of Troy: on one ſide may be ſeen the wooden horſe, and in the back part the temple of Pallas. The glaſſes for this act may be painted in the following manner. On the firſt may be palaces and houſes, repreſenting the inſide of a city. On the ſecond, the temple of Pallas in the centre, with a clear night and the moon. In the front may be ſeen the wooden horſe, that the Trojans have placed near the temple of Pallas. On the third, a troop of Greeks, with Sinon at their head, who are going to open the gates of the city to the Grecians. On the fourth, different troops of armed Greeks; painted on a long glaſs, to afford variety. On the fifth, ſeveral troops of Trojans. On the ſixth, various appearances of fire and ſmoke, ſo diſpoſed, that, this glaſs being drawn up above the others, the objects painted on the firſt glaſs may appear in a conflagration.

Before you draw up the curtain, you ſhould place the firſt and ſecond glaſſes. You then paſs the whole third glaſs ſlowly; a little after, the fourth, on which are painted the different bodies of armed Greeks; and at the ſame time, from the oppoſite ſide, the ſixth glaſs, that repreſents the Trojan troops; obſerving to move them ſlowly both in advancing and retreating, to imitate a combat (G). Then draw up, by degrees, the ſixth, on which are painted the fire, flame, and ſmoke, ſo that the palaces and houſes painted on the firſt glaſs may appear to take fire gradually, and at laſt preſent a general conflagration. After having repreſented theſe incidents with the greateſt attention, you let fall the curtain to prepare for the third act. In this may be repreſented the inſide of Priam's palace; where is ſeen an altar, round which ſeveral Trojan princeſſes appear, who have fled thither for ſafety. On the firſt glaſs may be painted the palace. On the ſecond, a view of the back part of the palace, with the altar. On the third, Priam with ſeveral Trojan men and women. On the fourth, Pyrrhus and a troop of Greeks. On the fifth, the ſame actors, with the palace in flames. On the ſixth, a conflagration.—The two firſt glaſſes which are to be drawn up, ſhould be placed before you raiſe the curtain. Then paſs the third; next advance the fourth; which being drawn up, diſcovers on the fifth the palace in flames; then drawing up the ſixth, let down the firſt, that the palace may appear entirely deſtroyed by the conflagration.

Plate CLXII.

The fourth act may repreſent the environs of Troy, with a diſtant proſpect of the ſea. The firſt and third glaſſes of the firſt act may be here uſed; to which may be added a third, repreſenting Æneas bearing his father Anchiſes, followed by his ſon Iulus and ſome Trojans. With this glaſs may be repreſented the flight of the Trojans and the embarkment of Æneas; with another glaſs, on which are painted certain veſſels.—To this act the following ſcenes may be added: The cave of Æolus; the back part of the cave; Æolus; the winds; Juno in her chariot.

The fifth act ſhould repreſent the open ſea, with the fleet of Æneas ſailing for Italy. On the firſt glaſs muſt be painted the ſea, as in the eleventh Experiment, or elſe the waves ſhould be imitated by another glaſs under the firſt. On the ſecond, the Trojan fleet. On the third, Neptune in his car. On the fourth, the palace of Jupiter. On the fifth, the inſide of the palace; the gods aſſembled in council, with Venus obtaining leave of Jupiter for Æneas to land in Italy.—After having placed the firſt glaſs, that repreſents a calm ſea, the curtain is raiſed, and the ſecond ſcene is advanced, which contains the Trojan fleet. The firſt is then brought forward, to repreſent a violent tempeſt: then raiſing the third glaſs, Neptune appears, who commands the waves to be ſtill, which is done by making the tempeſt ſubſide by degrees. The fleet then advances, and paſſes over the whole theatre: preſently after the fourth and fifth ſcenes deſcend, that repreſent Olympus, and finiſh the exhibition.

Note, We muſt here repeat, that if you would repreſent a ſubject of this ſort to advantage, it is quite neceſſary that the glaſſes be well painted; and thoſe that are to be in front ſhould be in ſtronger and more opaque colours, that the images of thoſe behind may not appear mixed with them, which will be the caſe if they are all equally tranſparent. The glaſſes ſhould alſo be of different lengths; that ſome being placed before the others are drawn away, their extremities may not be perceived.

The larger theſe ſubjects are repreſented, the better effect they will have: the front of the theatre ſhould appear to be about three feet wide; and if ſome parts of the figures were moveable, it would ſtill add to the variety of the entertainment.

(G) He that moves the glaſſes, ſeeing the effect they produce, is the better able to render the repreſentation as natural as poſſible.

DIOSCOREA, in botany: A genus of the hexandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male calyx is ſexpartite; there is no corolla: The female calyx is ſexpartite; no corolla; three ſtyles; the capſule trilocular and compreſſed; and there are two membranaceous ſeeds. There are eight ſpecies, of which the only remarkable one is the bulbifera, or yam. This hath triangular winged ſtalks, which trail upon the ground, and extend a great way: theſe frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly ſerviceable in the Weſt India iſlands, where they make the greateſt part of the negroes food. The plant is ſuppoſed to have been brought from the Eaſt to the Weſt Indies; for it has never been obſerved to grow wild in any part of America; but in the iſland of Ceylon, and on the coaſt of Malabar, it grows in the woods, and there are in thoſe places a great variety of ſorts. It is propagated by cutting the root in pieces, obſerving to preſerve an eye in each, as is practiſed in planting potatoes. One plant will produce three or four large roots. The ſkin of theſe roots is pretty thick, rough, unequal, covered with many ſtringy fibres or filaments, and of a violet colour approaching to black. The inſide is white, and of the conſiſtence of red beet. It reſembles the potato in its mealineſs, but is of a cloſer texture. When raw, the yams are viſcous and clammy: when roaſted or boiled, they afford very nouriſhing food; and are often preferred to bread by the inhabitants of the Weſt Indies, on account of their lightneſs and facility of digeſtion. When firſt dug out of the ground, the roots are placed in the ſun to dry: after which, they are either put into ſand, dry garrets, or caſks; where, if kept from moiſture, they may be preſerved whole years, without being ſpoiled or diminiſhed in their goodneſs. The root commonly weighs two or three pounds; tho' ſome yams have been found upwards of 20 pounds weight.

DIOSCORIDES, a phyſician of Cilicia, who lived, as ſome ſuppoſe, in the age of Nero. He was originally a ſoldier; but afterwards he applied himſelf to ſtudy, and wrote a book upon medicinal herbs.

DIOSCURIA (διοσκουρια, from Διος *Jupiter*, and κουροι *infants*), in antiquity, a feſtival in honour of the Διοσκουροι, or Caſtor and Pollux, who were reputed to be the ſons of Jupiter. It was obſerved by the Cyreneans, but more eſpecially by the Spartans, whoſe country was honoured by the birth of theſe heroes. The ſolemnity was full of mirth, being a time wherein they ſhared plentifully of the gifts of Bacchus, and diverted themſelves with ſports, of which wreſtling matches always made a part.

DIOSMA, African spiræa: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous, the nectarium crown-ſhaped above the germen; there are five capſules coalited; the ſeeds hooded. There are nine ſpecies; of which the moſt remarkable are the hirſuta, with narrow hairy leaves; and the oppoſitifolia, with leaves placed in the form of a croſs. The firſt is a very handſome ſhrub, growing to the height of five or ſix feet: the ſtalks are of a fine coral colour: the leaves come out alternately on every ſide of the branches, and are narrow-pointed and hairy: the flowers are produced in ſmall cluſters at the end of the ſhoots, and are of a white colour. They are ſucceeded by ſtarry ſeed-veſſels having five corners; in each of which corners is a cell, containing one ſmooth, ſhining, oblong, black ſeed: theſe ſeed-veſſels abound with a reſin which emits a grateful ſcent, as doth alſo the whole plant.—The ſecond ſpecies riſes to the height of three or four feet: the branches are ſlender, and produced from the ſtem very irregularly; the leaves are placed croſs-ways; the flowers are produced at the ends of the branches, between the leaves: the plants continue a long time in flower, and make a fine appearance when they are intermixed with other exotics in the open air. Both ſpecies are propagated by cuttings; which may be planted during any of the ſummer-months in pots, and plunged into a moderate hotbed, where they ſhould be ſhaded from the ſun, and frequently watered. In about two months they will have taken root; when each ſhould be tranſplanted into a ſmall pot where they are to remain; but during winter, like moſt other exotic plants, they muſt be preſerved in a green-houſe.

DIOSPOLIS (anc. geog.), a city of the Delta, or Lower Egypt; to the ſouth of the Buſiritic branch, before it divides into two.—Another of Bithynia, in the territory of Heraclea.—A third, called *Magna*, denoting Thebæ of the Higher Egypt.—A fourth, *Dioſpolis Parva*, the metropolis of the Nomos Dioſpolites of the Higher Egypt.—A fifth, *Dioſpolis* of Samaria, the ſame with Lydda.—A ſixth *Dioſpolis*, the ancient name of Laodicea of Phrygia on the Lycus.

DIOSPOLITES nomos (Ptolemy), a diviſion of Thebais or the Higher Egypt, to diſtinguiſh it from another of the Lower Egypt or the Delta; to the ſouth of the Nomos Thinites, on the weſt ſide of the Nile.

DIOSPYROS, the Indian date-plum: A genus of the diœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is hermaphrodite and quadrifid; the corolla urceolated and quadrifid; there are eight ſtamina; the ſtyle quadrifid; the berry octoſpermous: the male calyx, corolla, and ſtamina, as in the former. There are two ſpecies. 1. The lotus, which is ſuppoſed to be a native of Africa, from whence it was tranſplanted into ſeveral parts of Italy, and alſo into the ſouth of France. The fruit of this tree is ſuppoſed to be the lotus with which Ulyſſes and his companions were enchanted, and which made thoſe who eat of it forget their country and relations: (See alſo Rhamnus.) In the warm parts of Europe this tree grows to the height of 30 feet. In the botanic garden at Padua, there is one very old tree which has been deſcribed by ſome of the former botaniſts under the title of *guaiacum patavinum*. This tree produces plenty of fruit every year; from the ſeeds of which many plants have been raiſed. 2. The Virginiana, pinſhamin, perſimon, or pitchumon plum, is a native of America, but particularly of Virginia and Carolina. The ſeeds of this ſort have been frequently imported into Britain, and the trees are common in many nurſeries about London. It riſes to the height of 12 or 14 feet; but generally divides into many irregular trunks near the ground, ſo that it is very rare to ſee a handſome tree of this ſort. Though plenty of fruit is produced on theſe trees, it never comes to perfection in this country. In America the inhabitants preſerve the fruit till it is rotten, as is practiſed with medlars in England; when they are eſteemed very pleaſant. Both ſpecies are propagated by ſeeds: and the plants require to be treated tenderly while young; but when they are grown up, they reſiſt the greateſt cold of this country.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, ſo as to make one ſyllable.

The Latins pronounced the two vowels in their diphthongs ae or æ, oe or œ, much as we do; only that the one was heard much weaker than the other, tho' the diviſion was made with all the delicacy imaginable. Diphthongs, with regard to the eyes, are diſtinguiſhed from thoſe with regard to the ears: In the former, either the particular ſound of each vowel is heard in the pronunciation; or the ſound of one of them is drowned; or, laſtly, a new ſound, different from either, reſults from both: the firſt of theſe only are real diphthongs, as being ſuch both to the eye and ear. Diphthongs with regard to the ear are either formed of two vowels meeting in the ſame ſyllable, or whoſe ſounds are ſeverally heard; or of three vowels in the ſame ſyllable, which only afford two ſounds in the pronunciation.

Engliſh diphthongs, with regard to the eye and ear, are *ai, au, ea, ee, oi, oo, ou.* Improper Engliſh diphthongs, with regard to the eye only, are *aa, ea, eo, eu, ie, ei, oa, oe, ue, ui.*

DIPLOE, in anatomy, the ſoft meditullium, or medullary ſubſtance, which lies between the two laminæ of the bones of the cranium. See ANATOMY, n° 11.

DIPLOMA. See DIPLOMATICS.

In a peculiar ſenſe, it is uſed for an inſtrument or licence given by colleges, ſocieties, &c. to a clergyman to exerciſe the miniſterial function, or to a phyſician to practiſe the profeſſion, &c. after paſſing examination, or admitting him to a degree.

Bielfeld's Elements.

DIPLOMATICS, the ſcience of diplomas, or of ancient literary monuments, public documents, &c. It does not however, nor can it, abſolutely extend its reſearches to antiquity; but is chiefly confined to the middle age, and the firſt centuries of modern times. For though the ancients were accuſtomed to reduce their contracts and treaties into writing; yet they graved them on tables, or covered them over with wax, or braſs, copper, ſtone, or wood, &c. And all that in the firſt ages were not traced on braſs or marble, has periſhed by the length of time, and the number of deſtructive events.

1. The word *diploma* ſignifies, properly, a letter or epiſtle, that is folded in the middle, and that is not open. But, in more modern times, the title has been given to all ancient epiſtles, letters, literary monuments, and public documents, and to all thoſe pieces of writing which the ancients called *Syngrapha, Chirographa, Codicilli,* &c. In the middle age, and in the diplomas themſelves, theſe writings are called *Litteræ, Precepta, Placita, Chartæ indiculæ, Sagilla,* and *Bullæ;* as alſo *Panchartæ, Pantochartæ, Tractoriæ, Deſcriptiones,* &c. The originals of theſe pieces are named *Exemplaria,* or *Autographa, Chartæ authenticæ, Originalia,* &c. and the copies, *Apographa, Copiæ, Particulæ,* and ſo forth. The collections that have been made of them, are called *Chartaria* and *Chartulia.* The place where theſe papers and documents were kept, the ancients named *Scrinia, Tabularium,* or *Ærarium,* words that were derived from the tables of braſs, and, according to the Greek idiom, *Archeium* or *Archivum.*

2. In order to underſtand the nature of theſe ancient papers, diplomas, and manuſcripts, and to diſtinguiſh the authentic from the counterfeit, it is neceſſary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the branches of a tree named *Papyrus,* or *Biblum Ægyptiacum,* and which were paſted one over the other with the ſlime of the Nile, and were preſſed and poliſhed with a pumice-ſtone. This paper was very ſcarce; and it was of various qualities, forms, and prices, which they diſtinguiſhed by the names of *charta hieratica, luria, auguſta, amphitheatrica, ſaitica, tanirica, emporetica,* &c. They cut this paper into ſquare leaves, which they paſted one to the other, in order to make rolls of them: from whence an entire book was called *volumen,* from *volvendo;* and the leaves of which it conſiſted, *paginæ.* Sometimes, alſo, they paſted the leaves all together by one of their extremities, as is now practiſed in binding; by this method they formed the back of a book, and theſe the learned call *codices.* They rolled the volume round a ſtick, which they named *umbilicus;* and the two ends that came out beyond the paper, *cornua.* The title, wrote on parchment, in purple characters, was joined to the laſt ſheet, and ſerved it as a cover. They made uſe of all ſorts of ſtrings or ribbands, and even ſometimes of locks, to cloſe the book; and ſometimes alſo it was put into a caſe. But there is not now to be found, in any library or cabinet whatever, any one of theſe volumes. We have been aſſured, however, by a traveller, that he had ſeen ſeveral of them in the ruins of Herculaneum; but ſo damaged, the paper ſo ſtiff and brittle, by the length of time, that it was impoſſible to unrol them, and conſequently to make any uſe of them; for on the firſt touch they fell into ſhatters.

3. We are ignorant of the preciſe time when our modern paper was invented; and when they began to make uſe of pens in writing, inſtead of the ſtalks of reeds. The ink that the ancients uſed, was not made of vitriol and galls, like the modern, but of ſoot. Sometimes alſo they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is not difficult for thoſe who apply themſelves to this ſtudy, to diſtinguiſh the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters: but that which beſt diſtinguiſhes the original from the counterfeit is, the writing or character itſelf; which is ſo diſtinctly different from one century to another, that we may tell with certainty, within about 40 or 50 years, when any diploma was written. There are two works which furniſh the cleareſt lights on this matter, and which may ſerve as ſure guides in the judgments we may have occaſion to make on what are called *ancient diplomas.* The one is the celebrated treatiſe on the Diplomatic, by F. Mabillon; and the other, the firſt volume of the Chro-

nicon Gotvicenſe. We there find ſpecimens of all the characters, the flouriſhes, and different methods of writing, of every age. For theſe matters, therefore, we muſt refer our readers to thoſe authors; and ſhall here only add, that,

4. All the diplomas are wrote in Latin, and conſequently the letters and characters have a reſemblance to each other: but there are certain ſtrokes of the pen which diſtinguiſh not only the ages, but alſo the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are alſo uſually longer, and not ſo ſtrong as thoſe of manuſcripts. There has been alſo introduced a kind of court-hand, of a very diſproportionate length, and the letters of which are called *Exiles litteræ, criſpæ, ac protractiores.* The firſt line of the diploma, the ſignature of the ſovereign, that of the chancellor, notary, &c. are uſually wrote in this character.

5. The ſignature of a diploma conſiſts either of the ſign of the croſs, or of a monogram or cipher, compoſed of the letters of the names of thoſe who ſubſcribed it. The initial letters of the name, and ſometimes alſo the titles, were placed about this croſs. By degrees the cuſtom changed, and they invented other marks; as, for example, the ſign of Charlemagne was thus:

R
K—Λ—S
V
L

They ſometimes added alſo the dates and epoch of the ſignature, the feaſts of the church, the days of the kalendar, and other like matters. The ſucceſſive corruption of the Latin language, the ſtyle and orthography of each age, as well as their different titles and forms; the abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all theſe matters united, form ſo many characters and marks by which the authenticity of a diploma is to be known.

6. The ſeal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itſelf. It was afterward pendent from the paper, and incloſed in a box or caſe, which they called *bulla.* There are ſome alſo that are ſtamped on metal, and even on pure gold. When a diploma bears all the characters that are requiſite to the time and place where it is ſuppoſed to be written, its authenticity is not to be doubted: but, at the ſame time, we cannot examine them too ſcrupulouſly, ſeeing that the monks and prieſts of former ages have been very adroit in making of counterfeits; and the more, as they enjoyed the confidence of princes and ſtateſmen, and were even ſometimes in poſſeſſion of their rings or ſeals.

7. With regard to manuſcripts that were wrote before the invention of printing, it is neceſſary (1.), to know their nature, their eſſential qualities, and matter; (2.) to be able to read them freely, and without error; (3.) to judge of their antiquity by thoſe characters which we have juſt mentioned with regard to the diplomas; and, (4.) to render them of uſe in the ſciences. As there are ſcarce any of the ancient codes now remaining (ſee par. 2.), wrote on the Egyptian paper, or on wood, ivory, &c. we have only to conſider thoſe that are written on parchment or vellum (*membraneos*), and ſuch as are wrote on our paper (*chartaceos*). The former of theſe are in moſt eſteem. With regard to the character, theſe codes are written either in ſquare and capital letters, or in half ſquare, or round and ſmall letters. Thoſe of the firſt kind are the moſt ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other diſtinction. The codes which are wrote in letters that are half ſquare, reſemble thoſe we have in Gothic characters, as well for the age as the form of the letters. Such as are wrote in round letters are not ſo ancient as the former, and do not go higher than the ninth or tenth century. Theſe have ſpaces between the words, and ſome punctuation. They are likewiſe not ſo well wrote as the preceding, and are frequently diſfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c.

8. In the ancient Greek books, they frequently terminated the periods of a diſcourſe, inſtead of all other diviſion, by lines; and theſe diviſions were called, in Latin, *verſus*, from *vertendo:* for which reaſon theſe lines are ſtill more properly named *verſus* than *lineæ.* At the end of a work, they put down the number of verſes of which it conſiſted, that the copies might be more eaſily collated: and it is in this ſenſe we are to underſtand Trebonius, when he ſays, that the pandects contain 150,000 *pene verſuum.* Theſe codes were likewiſe *vel probæ vel deterioris notæ*, more or leſs perfect, not only with regard to the calligraphy or beauty of the character, but to the correction of the text alſo.

9. It is likewiſe neceſſary to obſerve, in ancient codes, the abbreviations, as they have been uſed in different centuries. Thus, for example, A. C. D. ſignifies, Aulus Caius Decimus; Ap. Cn. Appius Cneius; Aug. Imp. Auguſtus Imperator. The characters that are called *notæ*, are ſuch as are not to be found in the alphabet; but which, notwithſtanding, ſignify certain words. All theſe matters are explained in a copious manner by Voſſius, and in the Chronicon Gotvicenſe. Laſtly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, & anecdotos.* The critical art is here indiſpenſably neceſſary: its reſearches, moreover, have no bounds; and the more, as the uſe of it augments every day, by the diſcoveries that are made in languages, and by the increaſe of erudition.

DIPONDIUS, in the ſcripture-language, is uſed by St Luke to ſignify a certain coin which was of very little value. Our tranſlation of the paſſage is, *Are not two ſparrows ſold for two farthings?* In St Matthew, who relates the ſame thing, we read *Are not two ſparrows ſold for a farthing?* The Greek reads *aſſarion* inſtead of *as.* Now *aſſarion*, as ſome ſay, was worth half an *as*, that is to ſay, four French deniers and $\frac{1}{8}$th; and, according to others, two deniers and $\frac{5}{10}$ths. *Dipondius* ſeems rather to ſignify half an *as.* Calmet, Diction. Bibl. Luke xii. 6. Matt. x. 29.

Dr Arbuthnot differs in opinion from the author laſt quoted. He ſays, that this coin was at firſt *libralis*, or of a pound weight; and even when diminiſhed, it retained the name of *libella.* So that *dipondius* denotes two aſſes.

DIPPING, among miners, ſignifies the interruption or breaking off the veins of ore; an accident that gives them a great deal of trouble before they can diſcover the ore again. A great deal of the ſkill of the miners conſiſts in the underſtanding this dipping of the veins, and knowing how to manage in it. In Cornwall they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down towards the north three feet in height perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air-ſhafts when occaſion requires; yet, in the higher mountains of Dartmaer, there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt. Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances.

Dipping-Needle, an inſtrument uſed for obſerving the quantity of inclination towards the earth, aſſumed by any needle or other body after it has acquired the magnetic virtue. This was firſt obſerved by one Robert Norman, an Engliſhman, and maker of compaſſes for mariners, in the end of the 16th century; who finding that he was always obliged to counterbalance that end which turns to the north by a bit of wax or ſuch other ſubſtance, though the balance had been ever ſo exact before, publiſhed an account of his diſcovery as a matter of importance. The ſubject was inſtantly attended to; and inſtruments were not only contrived for aſcertaining the quantity of the dip, but various ſpeculations formed concerning the cauſe of ſuch a ſurpriſing phenomenon.

The general phenomena of the dipping-needle are: That about the equatorial parts of the earth it remains in an horizontal poſition, but depreſſes one end as we recede from theſe; the north end if we go towards the north, and the ſouth end if we proceed towards the ſouth pole. The farther north or ſouth that we go, the inclination becomes the greater; but there is no place of the globe hitherto diſcovered where it points directly downwards, though it is ſuppoſed that it would do ſo in ſome part very near the pole. Its inclination is likewiſe found to vary very conſiderably at different times in different places of the earth, and by ſome changes of ſituation in ſuch a manner as muſt appear at firſt ſight very unaccountable. Of all thoſe who have attempted the inveſtigation of this obſcure ſubject, none have been more ſucceſsful than M. Cavallo, who in his Treatiſe on Magnetiſm has given particular attention to all the phenomena, and accounted for them upon plain and rational principles, in the following manner.

The dip of the magnetical needle in general may be underſtood from the following eaſy experiment: Lay an oblong magnet horizontally upon a table, and over it ſuſpend another ſmaller magnet (a ſewing needle to which the magnetic virtue has been communicated will anſwer the purpoſe), in ſuch a manner as to remain in an horizontal poſition when not diſturbed by another magnet. Now, if this laſt ſmall magnet or ſewing needle, ſuſpended by the middle, be brought juſt over the middle of the large one, it will turn itſelf in ſuch a manner that the ſouth pole of the ſmall magnet will point towards the north pole of the large one; and if at an equal diſtance from both, will remain in an horizontal poſition. But if we move it nearer to one of the poles than the other, it will readily be underſtood that the correſponding end of the needle will be attracted by the pole to which it approaches, and of conſequence inclined downwards; the contrary end being proportionably elevated. It is likewiſe evident, that this inclination will be greater or leſs according to the diſtance at which the ſmall magnet is placed from the pole of the large one; the attraction of the neareſt pole having always the greateſt effect upon it. And it is equally plain, that when brought directly over one of the poles of the large magnet, it will turn its own contrary one directly towards it, and thus lie exactly in the axis of the large one.

The application of this experiment to the phenomena of the dipping-needle is obvious, as nothing more is requiſite for ſolving the whole myſtery than to ſuppoſe the earth itſelf to be the large magnet, and the magnetic needle or any other magnetic body the ſmall magnet in the experiment: for admitting that the *north* pole of the earth poſſeſſes a *ſouth* magnetiſm, and that the oppoſite pole is poſſeſſed of a north magnetical polarity; it appears, and the theory is confirmed by experiment, that when a magnet is ſuſpended properly in the equatorial parts of the world, it muſt remain in an horizontal poſition; but when removed nearer to one of the poles, it muſt incline one of its extremities, *viz.* that which is poſſeſſed of the contrary magnetic polarity; and that this inclination muſt increaſe in proportion as the magnet or magnetic-needle recedes from the equator of the earth; and, laſtly, when brought exactly upon either of the poles of the earth, it muſt ſtand perpendicular to the ground, or in the ſame direction with the axis of the earth.

The only difficulty in this explanation ariſes from the attributing a ſouth magnetiſm to the north pole of the earth: but by this our author means only that its magnetiſm is contrary to that end of the magnetic needle which turns towards it; and in the ſame manner it muſt be underſtood, that the ſouth pole of the earth has a north magnetic polarity.

If the extremities of the axis of the earth, or the poles about which it performs its diurnal revolution, coincided with its magnetic poles, or even if the magnetic poles were always at a certain diſtance from them, the inclination of the needle would be always the ſame at equal diſtances from the equator, and might be very uſeful for determining the latitudes. But it would ſeem, that theſe poles are perpetually ſhifting their place, ſince both the inclination and horizontal direction of the needle are continually varying even in the ſame place; ſo that its quantity of inclination cannot be exactly calculated. Two general remarks may be made upon this ſubject. 1. That the inclination of the needle does not alter regularly in going from north to ſouth, or from ſouth to north, in any meridian. 2. That its alteration in the ſame place, and at different times, is but ſmall. Thus, in London, about the year 1576, the dip was 71° 50′ below the horizon, and in 1775 it ſtood at 72° 3′; the alteration in near 200 years ſcarce amounting to three quarters of a degree, which may be attributed to the errors of the inſtruments; as theſe were at firſt exceedingly erroneous, and even yet are far from being arrived at perfection.

The general method of conſtructing dipping-needles is, to paſs an axis quite through the needle itſelf, and to let the extremities of the axis reſt upon two ſupports, like the beam of a pair of ſcales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally aſſume that poſition which is called the *magnetic line*, *viz*. the two ends nearly north and ſouth, and one of them inclined conſiderably to the horizon. The degrees of this inclination are ſhown upon a graduated circle; and when the inſtrument is made uſe of at land it has a ſtand, but at ſea a ring is neceſſary to ſuſpend it. When furniſhed with a ſtand, it has alſo a ſpirit-level; and the ſtand has three ſcrews, by which the whole is adjuſted in ſuch a manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the ſame line perpendicular to the horizon.

The greateſt imperfections attending this inſtrument are the balancing of the needle itſelf, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very ſmall, as ariſing only from duſt or moiſture. The method recommended by Mr Cavallo to obviate theſe inconveniences, is firſt to obſerve the dip of the needle; then to reverſe its magnetiſm by the application of magnets, ſo that the end of it which before was elevated above the horizon may now be below it; and, laſtly, to obſerve its dip again; for a mean of the two obſervations will be pretty near the truth, though the needle may not be perfectly balanced. See MAGNETISM, and *MAGNETICAL Needle*.

DIPSACUS, TEAZEL, in botany: A genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The common calyx is polyphyllous, proper above; the receptacle paleaceous. There are four ſpecies; the moſt remarkable of which is the carduus fullonum, which grows wild in many parts of England. It is of ſingular uſe in raiſing the knap upon woollen cloth. For this purpoſe, the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held againſt them. In the weſt of England, great quantities of the plant are cultivated for the uſe juſt now mentioned. It is propagated by ſowing the ſeeds in March, upon a ſoil that is well prepared. About one peck of ſeed is ſufficient for an acre, as the plants muſt have room to grow; otherwiſe the heads will not be large enough, nor in great quantity. When the plants come up, they muſt be hoed in the ſame manner as is practiſed for turnips, cutting down all the weeds, and thinning the plants to about eight inches diſtance; and as the plants advance, and the weeds begin to grow again, they muſt be hoed a ſecond time, cutting out the plants to a wider diſtance, ſo that they may finally ſtand a foot diſtant from each other. The ſecond year they will ſhoot up heads, which may be cut about the beginning of Auguſt. They are then to be tied up in bunches, and ſet in the ſun if the weather is fair; or if not, in rooms to dry them. The common produce is about 160 bundles or ſtaves upon an acre, which are ſold for one ſhilling each.

The leaves of the common wild teazel, dried, and given in powder or infuſion, are a very powerful remedy againſt flatuſes and crudities in the ſtomach. There is alſo another, though ſomewhat whimſical, uſe for which this plant is famous among the country people in England. If the heads are opened longitudinally, about September or October, there is generally found a ſmall worm in them: one of theſe only is found in each head, whence naturaliſts have named it the *vermis ſolitarius dipſaci*. They collect three, five, or ſeven of theſe, always obſerving to make it an odd number; and, ſealing them up in a quill, give them to be worn as an amulet againſt the ague. This ſupperſtitious remedy is in much higher repute than the bark, in many parts of England.

DIPSAS, a ſort of ſerpent, the bite of which produces ſuch a thirſt as proves mortal; whence its name *dipſas*, which ſignifies thirſty. In Latin it is called *ſitula*, "a pail." Moſes ſpeaks of it in Deut. viii. 15.

DIPTERA (from δις, and ϖτερον, *wing*), in zoology, an order of inſects, which have only two wings, and under each wing a ſtyle or oblong body, terminated by a protuberance or head, and called a *balancer*.

DIPTOTES, in grammar, are ſuch nouns as have only two caſes, as *ſuppetiæ*, *ſuppetias*, &c.

DIPTYCHA, in antiquity, a public regiſter, wherein were written the names of the conſuls, and other magiſtrates, among the heathens; and of biſhops, and defunct as well as ſurviving brethren, among the Chriſtians.

The word is formed from the Greek διπτυχων, or διπτυχα, and that from διπτυξ, a maſculine noun derived from ϖτυσσω *I fold*, or *plait*. From its future ϖτυξω is formed ϖτυξ a *fold* or *plait*, to which adding δις *twice*, we have διπτυξ, in the genitive διπτυχος, whence the nominative neuter διπτυχον, q. d. *a book folded in two leaves*; though there were ſome in three, and others in four or five leaves. An ingenious author imagines this name to have been firſt given them to diſtinguiſh them from the books that were rolled, called *volumina*.

It is certain there were profane diptycha in the Greek empire, as well as ſacred ones in the Greek church. The former were the matricula, or regiſter, wherein the names of the magiſtrates were entered; in which ſenſe diptycha is a term in the Greek chancery.

Sacred DIPTYCHA. The word is plural; diptycha being a double catalogue, in one whereof were written the names of the living, and in the other thoſe of the dead, which were to be rehearſed during the office. We meet with ſomething not unlike the ſacred diptychs of the Greeks, in the canon of the maſs according to the Latin uſage; where the people are enjoined to pray once for the living, and once for the dead; ſeveral ſaints are invoked in different times, &c. In theſe diptycha were entered the names of biſhops, who had governed their flocks aright; and theſe were never expunged out of the ſame, unleſs they were convicted of hereſy, or ſome other groſs crime. In the diptycha were likewiſe entered the names of ſuch as had done any ſignal ſervice to the church, whether they were living or dead, and mention was made of them in the celebration of the liturgy.

Caſaubon, in his obſervations on Athenæus, lib. vi. cap. 14. ſuppoſes the Chriſtians to have borrowed the cuſtom of writing names in a book, and rehearſing them at maſs, from the heathens, who entered the names of perſons they would do any ſignal honour to, in the verſes of the Salii; as was done to Germanicus and Verus, ſons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Mamurcus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib. ii. Spartian, Ovid, Feſtus, Plutarch, &c. But Fa. Roſweyd does not approve this notion of Caſaubon. The pretended St Dionyſius, a very ancient author, ſays the contrary, and aſſerts the firſt eſtabliſhment of this uſage to have been founded on Scripture, 2 Tim. ii. 19. Pſalm cxvi. 15. Roſweyd adds Eccleſiaſtic. xliv. 1. and takes theſe to have been the paſſages the ancient church had a view to, rather than the Salian verſes.

The profane diptycha were frequently ſent as preſents to princes, &c. on which occaſion they were finely gilt, and embelliſhed; as appears from Symmachus, lib. ii. ep. 81. Thoſe preſented were uſually of ivory. The firſt law, De Expenſ. Ludor. C. Theod. forbids all magiſtrates below conſuls to make preſents of diptycha of ivory in the puplic ceremonies.

DIRCA, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 31ſt order, *Vepreculæ*. There is no clayx; the corolla is tubular, with the limb indiſtinct; the ſtamina are longer than the tube; the berry is monoſpermous.

DIRÆ, the general name of the three Furies in the Pagan ſyſtem of theology. They were ſo called, as being *quaſi Deorum iræ*, the miniſters of divine vengeanc in puniſhing guilty ſouls after death. They were the daughters of *Night* and *Acheron*. See Furies.

DIRECTION, in mechanics, ſignifies the line or path of a body's motion, along which it endeavours to proceed according to the force impreſſed upon it. See Mechanics.

DIRECTOR, in commercial polity, a perſon who has the management of the affairs of a trading company: thus we ſay, the directors of the India company, South-ſea company, &c. See Company.

The directors are conſiderable proprietors in the ſtocks of their reſpectives companies, being choſen by plurality of votes from among the body of proprietors. The Dutch Eaſt India company have 60 ſuch directors; that of France, 21; the Britiſh Eaſt India company has 24, including the chairman, who may be re-elected for four years ſucceſſively. Theſe laſt have ſalaries of 150l. a-year each, and the chairman 200l. They meet at leaſt once a-week, and commonly oftener, being ſummoned as occaſion requires. The directors of the Bank of England are 24 in number, including governor and deputy governor.

Director, in ſurgery, a grooved probe, to direct the edge of the knife or ſciſſars in opening ſinuſes or fiſtulæ, that by this means the adjacent veſſel, nerves, and tendons, may remain unhurt. See Surgery.

DIRIBITORES, among the Romans, officers appointed to diſtribute tablets to the people at the comitia. See Comitia.

DIRIGENT, or Directrix, a term in geometry, ſignifying the line of motion, along which the deſcribent line or ſurface is carried in the geneſis of any plane or ſolid figure.

DIS, an inſeparable article prefixed to divers words; the effect whereof is either to give them a ſignification contrary to what the ſimple words have, as *diſoblige*, *diſobey*, &c.; or to ſignify a ſeparation, detachment, &c. as *diſpoſing*, *diſtributing*.

Dis, a town of Norfolk, ſeated on the river Waveney, on the ſide of a hill. It is a neat flouriſhing town, with one large church, a Preſbyterian and a Quaker meeting. It has about 600 good houſes, the ſtreets are well paved, pretty wide, and always clean. At the weſt end of the town is a large meer or lake; but ſo muddy, that the inhabitants can make no other uſe of it but in catching of eels. In the town are carried on manufactories of ſail-cloth, hoſe, and the making of ſtays. E. Long. 1. 16. N. Lat. 52. 25.

Dis, a god of the Gauls, the ſame as Pluto the god of hell. The inhabitants of Gaul ſuppoſed themſelves deſcended from that deity.

DISA, in botany: A genus of the diandria order, belonging to the gynandria claſs of plants. The ſpatha is univalvular; the petals three; the third ſmaller than the reſt, bifid, and gibbous at the baſe.

DISABILITY, in law, is when a man is diſabled, or made incapable to inherit any lands, or take that benefit which otherwiſe he might have done: and this may happen four ways; by the act of an anceſtor, or of the party himſelf; by the act of God, or of the law. 1. Diſability by the act of the anceſtor, is where the anceſtor is attainted of high treaſon, &c. which corrupts the blood of his children, ſo that they may not inherit his eſtate. 2. Diſability by the act of the party, is where a man binds himſelf by obligation, that, upon ſurrender of a leaſe, he will grant a new eſtate to a leſſee; and afterwards he grants over the reverſion to another, which puts it out of his power to perform it. 3. Diſability by the act of God, is where a man is *non ſanæ memoriæ*, whereby he is incapable to make any grant, &c. So that, if he paſſeth an eſtate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age ſhall never be received to diſable his own perſon." 4. Diſability by the act of the law, is where a man by the ſole act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, in botany: A genus of the digynia order, belonging to the heptandria claſs of plants. The calyx has ſeven leaves; the corolla parted into ſeven, and flat; the capſule two-celled.

Islands of DISAPOINTMENT, are a cluſter of ſmall iſlands, lying in S. Lat. 14. 10. W. Long. 141. 16. They were diſcovered by Commodore Byron in 1765, who gave them their name from the ſhores affording no anchorage for his ſhips; for which reaſon he was obliged to quit them without landing, or procuring any refreſhments for his crew, who were then languiſhing with ſickneſs. They are inhabited by Indians, who appeared on the beach with ſpears in their hands, that were at leaſt 16 feet long. They every where diſcovered hoſtile intentions, and ſeemed by ſigns to threaten the people in the boat with death if they came aſhore. There are cocoa-trees in great abundance, and the ſhore abounds with turtle.

DISC, in antiquity, a quoit made of ſtone, iron, or copper, five or ſix fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vaſt diſtance, by the help of a leathern thong tied round the perſon's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulyſſes great artiſts at this ſport.

Disc, in aſtronomy, the body and face of the ſun and moon, ſuch as it appears to us on the earth; or the body and face of the earth, ſuch as it appears to a ſpectator in the moon.

Disc, in optics, is the width of the aperture of teleſcopic glaſſes, whatever their form be, whether plain, convex, concave, &c.

DISCERNING, or Discernment, a faculty of the mind whereby it diſtinguiſhes between ideas. See Metaphysics.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philoſopher, &c. are called *diſciples*. In the Chriſtian ſenſe, they were followers of Jeſus Chriſt, in general; but in a more reſtrained ſenſe, the diſciples denote thoſe alone who were the immediate followers and attendants on his perſon, of which there were 70 or 72. The names *diſciple* and *apoſtle* are often ſynonymouſly uſed in the goſpel-hiſtory; but ſometimes the apoſtles are diſtinguiſhed from diſciples, as perſons ſelected out of the number of diſciples, to be the principal miniſters of his religion: of theſe there were only 12. The Latins kept the feſtival of the 70 or 72 diſciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general ſenſe, denotes inſtruction and government, as military diſcipline, eccleſiaſtical diſcipline, &c.

Eccleſiaſtical diſcipline conſiſts in putting thoſe laws in execution by which the church is governed, and inflicting the penalties enjoined by them againſt the ſeveral ſorts of offenders that profeſs the religion of Jeſus. The primitive church never pretended to exerciſe diſcipline upon any but ſuch as were within her pale, in the largeſt ſenſe, by ſome act of their own profeſſion; and even upon theſe ſhe never pretended to exerciſe her diſcipline ſo far as to cancel or diſannul their baptiſm: all that ſhe pretended to, was to deprive men of the benefits of external communion, ſuch as public prayer, receiving the euchariſt, and other acts of divine worſhip. The church-diſcipline was only confined to the admonition of the party, and to the leſſer and greater excommunication.

As to the objects of eccleſiaſtical diſcipline, they were all ſuch delinquents as fell into great and ſcandalous crimes after baptiſm.

Diſcipline, in a more peculiar ſenſe, is uſed for the chaſtiſements or bodily puniſhments inflicted on a religious of the Romiſh church who has been found a delinquent; or even for that which the religious voluntarily undergo or inflict on themſelves, by way of mortification.

Book of Discipline in the hiſtory of the church of Scotland, is a common order, drawn up by the aſſembly of miniſters in 1650, for the reformation and uniformity to be obſerved in the diſcipline and policy of the church. In this book the government of the church by prelates is ſet aſide, church-ſeſſions are eſtabliſhed, the ſuperſtitious obſervation of faſt-days and ſaints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy-council, and is called *the firſt book of diſcipline*.

DISCORD, in general, ſignifies diſagreement, or oppoſition between different perſons or things.

Discord, in muſic, every ſound which, joined with another, forms an aſſemblage diſagreeable to the ear; or rather, every interval whoſe extremes do not coaleſce. Now, as there are no other concords or conſonances, except thoſe which form amongſt themſelves, and with their fundamental ſound, perfect chords, it follows, that every other interval muſt be a real diſſonance or diſcord: even the third and ſixth were reckoned ſuch among the ancients, who excluded them from the number of conſonant chords.

The term *diſſonance*, which is ſynonymous with diſcord, is compounded of two words, the inſeparable prepoſition *dis* and the verb *ſonare*; which, both in a literal and metaphorical ſenſe, ſignifies *diſagreement* or *diſunion*. In reality, that which renders diſſonances grating, is, that the ſounds which form them, far from uniting in the ear, ſeem to repel each other, and are heard each by itſelf as two diſtinct ſounds tho' produced at the ſame time.

This repulſion or violent oſcillation of ſounds is heard more or leſs as the vibrations which produce it are more or leſs frequently coincident. When two vocal ſtrings are gradually tuned, till they approach a conſonant interval, the pulſations become ſlower as the chord grows more juſt, till at laſt they are ſcarcely heard, if heard at all; from whence it appears certain, that the pleaſure produced in us by harmony reſults from the more or leſs exact and frequent coincidence of vibrations; though the reaſon why this coincidence ſhould give pleaſure, more than any other modification or combination of ſounds, appears to us inſcrutable. The agreeable effects of diſſonance in harmony, are no objection to this theory; ſince it is allowed, that the ſenſations excited by diſcord are not in themſelves immediately and neceſſarily pleaſing, but only pleaſe by auricular deception. The ear is ſurpriſed with the ſhock it receives, without being able to imagine how it ſhould have happened; and in proportion as it is harſh and grating, we feel the pleaſure of returning harmony enhanced, and the diſappointment of being artfully and inſenſibly extricated more agreeable.

The name of *diſſonance*, is given ſometimes to the interval, and ſometimes to each of the two ſounds which form it. But though two ſounds equally form a diſſonance between themſelves, the name is moſt frequently given to that ſound in particular which is moſt extraneous to the chord.

The number of poſſible diſſonances is indefinite; but as in muſic we exclude all intervals which are not found in the ſyſtem received, the number of diſſonances is reduced to a very few: beſides, in practice, we can only ſelect from thoſe few, ſuch as are agreeable to the ſpecies, and the mode in which we compoſe; and from this laſt number we muſt exclude ſuch as cannot be uſed conſiſtently with the rules preſcribed. But what are theſe rules? Have they any foundation in nature, or are they merely arbitrary? This is what Rouſſeau, whom in this article we have followed or abandoned as his obſervations appeared uſeful or frivolous, propoſes to inveſtigate as its principal object.

But where does his ſcrutiny terminate? Not in the abolition of the rules preſcribed. Theſe have ſtill ſubſiſted, and will ſtill ſubſiſt, while the frame of man, and the nature of muſic, remain what they are. If then the rules be permanent and univerſal, the principle upon which they are founded may be latent or ambiguous; but the rules themſelves can never be purely arbitrary. How elſe could it happen, that Rameau, D'Alembert, and Rouſſeau, ſhould admit the force and effect of theſe rules, whilſt each of thoſe maſters exerts his whole genius to give a different account of their cauſe and origin? Rouſſeau himſelf, as we have ſeen in a former article, inculcates the neceſſity of diſſonances for the completion of harmony; (ſee CHORD). Now if this be true, the eaſieſt methods of introducing and diſmiſſing theſe diſcords muſt be the moſt eligible, and of conſequence the rules for uſing them muſt be eſtabliſhed. It is not then upon the ſubſiſtence or demolition of any particular theory that they depend. Should we attend to the particular objections which may be urged againſt any ſyſtem whatever; where is the theory which will be found proof againſt the efforts of ſcepticiſm? After all, the objections of Rouſſeau againſt Rameau's theory, as applied by D'Alembert to the origin of conſonances, (ſee MUSIC, art. 94, 95, 96, 97, 98, 99,) appear to be much more frivolous than the analogies from which he pretends this origin to be deduced. It appears from D'Alembert's expoſition of this theory, that, if not for all, it affords a ſolution for the moſt material and eſſential phenomena in harmony; which is ſufficient for its eſtabliſhment, till another can be found, which gives a rational and conſiſtent account of the whole: a diſcovery which has not yet been made. But, whilſt we acknowledge the futility of Rouſſeau's objections againſt D'Alembert's explication of diſſonances, we muſt at the ſame time admire the ingenuity with which he has deduced them from principles purely mechanical, without departing from the ſyſtem of M. Rameau. This mechanical explication will be found in his Muſical Dictionary, under the article *Diſſonánte*.

DISCORD, (the goddeſs of), in Pagan theology. She is repreſented by Ariſtides with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her boſom. It was ſhe who at the marriage of Peleus and Thetis threw in the golden apple, whereon was written "To the faireſt:" which occaſioned a contention between the goddeſſes Juno, Minerva, and Venus; each pretending a title to the apple. She was likewiſe called *Ate* and *Eris*.

DISCOVERY, in dramatic poetry, a manner of unravelling a plot or fable in tragedies, comedies, and romances; wherein, by ſome unforeſeen accident, a diſcovery is made of the name, fortune, quality, &c. of a principal perſon, which were before unknown. See CATASTROPHE.

DISCOUNT, in commerce, a term among traders, merchants, and bankers. It is uſed by the two former on occaſion of their buying commodities on the uſual time of credit, with a condition that the ſeller ſhall allow the buyer a certain diſcount at the rate of ſo much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for ſuch commodities, inſtead of taking the time of credit. Traders and merchants alſo frequently taking promiſſory notes for moneys due payable to them or order at a certain time, and ſometimes having occaſion for money before the time is elapſed, procure theſe notes to be diſcounted by bankers before the time of payment. Bills of exchange are alſo diſcounted by bankers; and in this conſiſts one article of the profits of banking. See BANK.

DISCRETE, or DISJUNCT, PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the ſame, but there is not the ſame proportion between all the four numbers. Thus if the numbers 3 : 6 : : 8 : 16 be conſidered, the ratio between 3 : 6 is the ſame as that between 8 : 16, and therefore the numbers are proportional: but it is only diſcretely or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3 : 6 : : 12 : 24.

DISCRETION, prudence, or knowledge to govern one's ſelf.

There are many more ſhining qualities in the mind of man, but there is none ſo uſeful as diſcretion; it is this indeed that gives a value to all the reſt, which ſets them at work in their proper times and places; and turns them to the advantage of the perſon who is poſſeſſed of them. Without it learning is pedantry, and wit impertinence; virtue itſelf looks like weakneſs; the beſt parts only qualify a man to be more ſprightly in errors, and active to his own prejudice.

Nor does diſcretion only make a man maſter of his own parts, but of other mens. The diſcreet man finds out the talents of thoſe he converſes with, and knows how to apply them to proper uſes. Accordingly, if we look into particular communities and diviſions of men, we may obſerve that it is the diſcreet man, not the witty, nor the learned, nor the brave, who guides the converſation, and gives meaſures to the ſociety. A man with great talents, but void of diſcretion, is like Polyphemus in the fable, ſtrong and blind, endued with an irreſiſtible force, which for want of ſight is of no uſe to him. Though a man has all other perfections, and wants diſcretion, he will be of no great conſequence in the world; but if he has this ſingle talent in perfection, and but a common ſhare of others, he may do what he pleaſes in his particular ſtation of life.

It is proper, however, to diſtinguiſh between *diſcretion* and *cunning*, the latter being the accompliſhment only of little mean ungenerous minds. Diſcretion points out the nobleſt ends to us, and purſues the moſt proper and laudable methods of attaining them: cunning has only private ſelfiſh aims, and ſticks at nothing which may make them ſucceed. Diſcretion has large and extended views, and, like a well-formed eye, commands a whole horizon: cunning is a kind of ſhort-ſightedneſs, that diſcovers the minuteſt objects which are near at hand, but is not able to diſcern things at a diſtance. Diſcretion, the more it is diſcovered, gives the greater authority to the perſon who poſſeſſes it:

cunning, when it is once detected, loſes its force, and makes a man incapable of bringing about even thoſe events which he might have done, had he paſſed only for a plain man. Diſcretion is the perfection of reaſon, and a guide to us in all the duties of life; cunning is a kind of inſtinct, that only looks out after our immediate intereſt and welfare. Diſcretion is only found in men of ſtrong ſenſe and good underſtanding: cunning is often to be met with in brutes themſelves, and in perſons who are but the feweſt removes from them. In ſhort, cunning is only the mimic of diſcretion, and may paſs upon weak men, in the ſame manner as vivacity is often miſtaken for wit, and gravity for wiſdom.

DISCUS, in antiquity. See Disc.

Discus, in botany, the middle part of a radiated compound flower, generally conſiſting of ſmall florets, with a hollow regular petal. It is commonly ſurrounded by large, plain, or flat, tongue-ſhaped petals, in the circumference or margin; as in daiſy, groundſel, and leopards bane: ſometimes the circumference is naked, as in cotton-weed and ſome ſpecies of colts-foot.

Discus Folii, the ſurface of the leaf.

DISCUSSION, in matters of literature, ſignifies the clear treating or handling of any particular point, or problem, ſo as to ſhake off the difficulties with which it is embarraſſed: thus we ſay, *ſuch a point was well diſcuſſed*, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are ſuch remedies, as, by their ſubtilty, diſſolve a ſtagnating or coagulated fluid; and diſſipate the ſame without an external ſolution of continuity.

DISDIACLASTIC crystal, in natural hiſtory, a name given, by Bartholine and ſome others, to the pellucid foſſile ſubſtance, more uſually called, from the place whence it was firſt brought, *Iſland cryſtal;* tho' properly it is no cryſtal at all, but a fine pellucid ſpar, called by Dr Hill, from its ſhape, *parallelopipedum.* See *Island Cryſtal.*

DISDIAPASON, or Bisdiapason, in muſic, a compound concord, deſcribed by F. Parran, in the quadruple ratio of 4 : 1, or 8 : 2.

Disdiapason Diapente, a concord in a ſextuple ratio of 1 : 6.

Disdiapason Semi-Diapente, a compound concord in the proportion of 16 : 3.

Disdiapason Ditone, a compound conſonance in the proportion of 10 : 2.

Disdiapason Semi-Ditone, a compound concord in the proportion of 24 : 5.

DISEASE, has been variouſly defined by phyſicians, almoſt every founder of a new ſyſtem having given a definition of *diſeaſe*, differing in ſome reſpects from his predeceſſors. For a particular account of theſe definitions, ſee Medicine.

Of all animals, man is ſubject to the moſt diſeaſes; and of men, the ſtudious and ſpeculative are moſt expoſed thereto. Other animals have their diſeaſes; but they are in ſmall number: nor are plants without them; though their maladies ſcarce exceed half a ſcore. The ancients deified their diſeaſes. Some diſeaſes only impair the uſe of the part immediately affected; as the ophthalmia, gout, &c. Others deſtroy it entirely; as the *gutta ſerena*, palſy, &c. Some affect the whole body; as the fever, apoplexy, epilepſy, &c. Others only impair a part; as the aſthma, colic, dropſy, &c. Some only affect the body; as the gout: others diſturb the mind; as melancholy, delirium, &c. Laſtly, others affect both the body and mind; as the mania, phrenſy, &c.

The colder the country, in general, the fewer and the leſs violent are the diſeaſes. Scheffer tells us that the Laplanders know no ſuch thing as the plague, or fevers of the burning kind, nor are ſubject to half the diſtempers we are. They are robuſt and ſtrong, and live to 80, 90, and many of them to more than 100 years; and at this great age they are not feeble and decrepid as with us; but a man of 90 is able to work or travel as well as a man of 60 with us. They are ſubject, however, to ſome diſeaſes more than other nations: thus they have often diſtempers of the eyes, which is owing to their living in ſmoke, or being blinded by the ſnow. Pleuriſies and inflammations of the lungs are alſo very frequent among them; and the ſmall-pox often rages with great violence. They have one general remedy againſt theſe and all other internal diſeaſes: this is the root of that ſort of moſs, as Scheffer expreſſes it, which they call *jerth*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doſes of it warm, to keep up a breathing ſweat; if they cannot get this, they uſe the ſtalks of angelica boiled in the ſame manner: they have not ſo great an opinion of this as of the other remedy; but the keeping in a ſweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their diſeaſes, whether either the one or the other of the drugs have any virtue or not. They cure pleuriſies by this method in a very few days; and get ſo well through the ſmall-pox with it, that very few die of it.

It has been always obſerved, that people of particular places were peculiarly ſubject to particular diſeaſes, which are owing to their manner of living, or to the air and effluvia of the earth and waters. Hoffman has made ſome curious obſervations on diſeaſes of this kind. He obſerves, that ſwellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors ſay, Who wonders at a ſwelled throat in the Alps? The people of Swiſſerland, Carynthia, Styria, the Hartz foreſt, Tranſylvania, and the inhabitants of Cronſtadt, he obſerves, are all ſubject to this diſeaſe from the ſame cauſe.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and ſarcoceles; and all theſe diſorders ſeem to be owing originally to their eating very large quantities of cheſnuts. The people of our own nation are peculiarly afflicted with hoarſeneſſes, catarrhs, coughs, dyſenteries, conſumptions, and the ſcurvy; and the women with the *fluor albus* or whites; and children with a diſeaſe ſcarce known elſewhere, which we call the *rickets*. In different parts of Italy different diſeaſes reign. At Naples the venereal diſeaſe is more common than in any other part of the world. At Venice, people are peculiarly ſubject to the bleeding piles. At Rome, tertian agues and lethargic diſtempers are moſt common. In Tuſcany, the epilepſy or falling ſickneſs. And in Apulia they are moſt ſubject to burning fevers, pleuriſies, and to that ſort of madneſs which is attributed to the bite of the tarantula, and which, it is ſaid, is only to be cured by muſic. In Spain apoplexies are common, as alſo melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly ſubject to the ſcurvy, and to the ſtone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the ſcurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is ſcarce ever ſuch a diſeaſe met with; though peripneumonies are very common in theſe places, as alſo diſeaſes of the eyes and violent pains of the head. The Ruſſians and Tartars are afflicted with ulcers, made by the cold, of the nature of what we call chilblains, but greatly worſe; and in Poland and Lithuania there reigns a peculiar diſeaſe called the *plica polonica*, ſo terribly painful and offenſive, that ſcarce any thing can be thought of worſe. The people of Hungary are very ſubject to the gout and rheumatiſm: they are more infeſted alſo with lice and fleas than any other people in the world, and they have a peculiar diſeaſe which they call *cremor*. The Germans, in different parts of the empire, are ſubject to different reigning diſeaſes. In Weſtphalia, they are peculiarly troubled with peripneumonies and the itch. In Sileſia, Franconia, Auſtria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the noſe, and other hæmorrhages; and to the gout, inflammations, and conſumptions. In Miſnia they have purple fevers; and the children are peculiarly infeſted with worms. In Greece, Macedonia, and Thrace, there are very few diſeaſes; but what they have are principally burning fevers and phrenzies. At Conſtantinople the plague always rages; and in the Weſt Indian iſlands, malignant fevers, and the moſt terrible colics. Theſe diſeaſes are called *endemic*.

Diseases of Horſes. See Farriery.

Diseases of Dogs. See Dogs.

Diseases of Plants. See Agriculture, n° 69, *et ſeq*. and Blight, Mildew, &c.

DISEMBOGUE. When a ſhip paſſes out of the mouth of ſome great gulf or bay, they call it *diſemboguing*. They ſay alſo of a river, that at ſuch a place, or after it has run ſo many leagues, it diſembogues itſelf into the ſea.

DISFRANCHISING, among civilians, ſignifies the depriving a perſon of the rights and privileges of a free citizen or ſubject.

DISGUISE, a counterfeit habit. Perſons doing unlawful acts in diſguiſe are by our ſtatutes ſometimes ſubjected to great penalties, and even declared felons. Thus by an act, commonly called the *black act*, perſons appearing diſguiſed and armed in a foreſt or grounds incloſed, or hunting deer, or robbing a warren or a fiſh-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and ſix inches wide; by which all miners meaſure their ore. If any be taken ſelling their ore, not firſt meaſuring it by the bar-maſter's diſh, and paying the king's duty, the ſeller forfeits his ore, and the buyer forfeits for every ſuch offence 40 ſhillings to the lord of the field or farmer.

DISJUNCTIVE, ſomething that ſeparates or diſjoins. Thus, *or*, *neither*, &c. which in connecting a diſcourſe yet ſeparates the parts of it, are called *diſjunctive conjunctions*.

DISK. See Disc.

DISLOCATION, the putting a bone out of joint by ſome violence, uſually called by the phyſicians *luxation*.

DISMISSION *of a Bill*, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is diſmiſſed with coſts. It may be alſo diſmiſſed for want of proſecution, which is in the nature of a non-ſuit at law, if he ſuffers three terms to elapſe without moving forward in the cauſe.

DISMOUNTING, in the military art, the act of unhorſing. Thus, to diſmount the cavalry, the dragoons, or the like, is to make them alight. To diſmount the cannon, is to break their carriages, wheels, and axletrees, ſo as to render them unfit for ſervice. Horſes are alſo diſmounted when they are rendered unfit for ſervice.

DISPARAGEMENT, in law, is uſed for the matching an heir, &c. in marriage, below his or her degree or condition, or againſt the rules of decency. The word is a compound of the privative particle *dis*, and *par*, "equal."

DISPART, in gunnery, is the ſetting a mark upon the muzzle-ring, or thereabouts, of a piece of ordnance, ſo that a ſight-line taken upon the top of the baſe-ring againſt the touch-hole, by the mark ſet on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the baſe ring, and of the place where the diſpart is to ſtand, and divide the difference between them into two equal parts, one of which will be the length of the diſpart which is ſet on the gun with wax or pitch, or faſtened there with a piece of twine or marlin. By means of an inſtrument it may be done with all poſſible nicety.

DISPATCH, a letter on ſome affair of ſtate, or other buſineſs of importance, ſent with care and expedition, by a courier expreſs. The buſineſs of diſpatches lies on the ſecretaries of ſtate and their clerks. The king gives directions to his miniſters abroad by diſpatches. The word is alſo uſed for the packet or mail containing ſuch letters. The French, during the reign of Louis XIV. had a *conſeil des depeches*, "council of diſpatches," held in the king's preſence, at which the dauphin, the duke of Orleans, the chancellor, and four ſecretaries of ſtate, aſſiſted.

DISPAUPER. A perſon ſuing *in forma pauperis*, is ſaid to be diſpaupered, if, before the ſuit is ended, he has any lands or other eſtate fallen to him, or if he has any thing to make him loſe his privilege. See the article *Forma Pauperis*.

DISPENSARY, or Dispensatory, denotes a book containing the method of preparing the various kinds of medicines uſed in pharmacy. Such are thoſe of Bauderon, Quercetan, Zwelfer, Charas, Bates, Meſue, Salmon, Lemery, Quincy, &c. but the lateſt and moſt eſteemed, beſide the London and Edinburgh Pharmacopœias, is the Edinburgh New Diſpenſatory, being an improvement upon that of Dr Lewis's.

Dispensary, or *Diſpenſatory*, is likewiſe a magazine or office for ſelling medicines at prime coſt to the poor. The college of phyſicians maintain three of theſe in London; one at the college itſelf in Warwick-lane; another in St Peter's alley, Cornhill; and a third in St Martin's lane. Diſpenſaries have alſo been eſtabliſhed in ſeveral of the principal towns in Scotland and England; particularly in Edinburgh, Dundee, and Kelſo; as alſo at Newcaſtle upon Tyne.

DISPENSATION, in law, the granting a licenſe of doing ſome certain action that otherwiſe is not permitted.

DISPERSION, in general, ſignifies the ſcattering or diſſipating ſomething. Hence

Dispersion, in optics, the ſame with the divergency of the rays of light.

Point of Dispersion, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

Dispersion of Inflammation, in medicine and ſurgery, is the removing the inflammation, and reſtoring the inflamed part to its natural ſtate.

Dispersion of Mankind, in the hiſtory of the world, was occaſioned by the confuſion of tongues, and took place in conſequence of the overthrow of Babel at the birth of Peleg; whence he derived his name: and it appears by the account given of his anceſtors, Gen. chap. xi. 10—16, to have happened in the 101ſt year after the flood according to the Hebrew chronology, and by the Samaritan computation in the 401ſt. However, various difficulties have been ſuggeſted by chronologers concerning the true era of this event. Sir John Marſham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a diſperſion of mankind before the birth of Peleg. Others, unable to find numbers ſufficient for the plantation of colonies in the ſpace of 101 years, according to the Hebrew computation, fix the diſperſion towards the end of Peleg's life, thus following the computation of the Jews. Petavius aſſigns the 153d year after the flood; Cumberland the 180th; and Uſher, though he generally refers it to the time of Peleg's birth, in one place aſſigns the 131ſt after the flood for this event. Mr Shuckford ſuppoſes the diſperſion to have been gradual, and to have commenced with the ſeparation of ſome companies at the birth of Peleg, and to have been completed 31 years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768: Cumberland makes them 30,000: Mr Mede ſtates them at 7000 men, beſides women and children: and Mr Whiſton, who ſuppoſes that mankind now double themſelves in 400 years, and that they doubled themſelves between the deluge and the time of David in 60 years at a medium, when their lives were ſix or ſeven times as long as they have been ſince, by his computation produces about 2389; a number much too inconſiderable for the purpoſes of ſeparating and forming diſtinct nations. This difficulty induced Mr Whiſton to reject the Hebrew and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furniſhes, by the laſt mentioned mode of computation, more than 240,000 perſons.

As to the manner of the diſperſion of the poſterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmoſt regularity and order. The ſacred hiſtorian informs us, that they were divided in their lands; every one according to his tongue, according to his family, and according to his nation, Gen. x. 5, 20, 31: and thus, as Mr Mede obſerves, they were ranged according to their nations, and every nation was ranged by their families; ſo that each nation had a ſeparate lot, and each family in every nation. The following abſtract will ſerve to give a general idea of their reſpective ſettlements: Japhet, Noah's eldeſt ſon, had ſeven ſons; *viz.* Gomer, whoſe deſcendants inhabited thoſe parts of Aſia which lie upon the Ægean Sea and Helleſpont northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia. The Galatians, according to Joſephus, were called *Gomeræi*; and the Cimmerii, according to Herodotus, occupied this tract of country: and from theſe Gomerians, Cimmerii, or Celts, Mr Camden derives our ancient Britons, who ſtill retain the name *Cymro* or *Cymru*. Magog, the ſecond ſon of Japhet, was probably the father of the Scythians on the eaſt and north-eaſt of the Euxine Sea. Madai planted Media, though Mr Mede aſſigns Macedonia to his ſhare. Javan was the father of the Grecians about Ionia, whoſe country lies along upon the Mediterranean Sea; the radicals of Javan and Ionia being the ſame *. To Tubal and Meſhech belonged Cappadocia and the country which lies on the borders of the Euxine Sea; and from them, migrating over the Caucaſus, it is ſuppoſed the Ruſſians and Moſcovites are deſcended. And Tiras occupied Thrace. The ſons of Shem were five: Elam, whoſe country lay between the Medes and Meſopotamians, and was called by the Gentile writers *Elymais*; and Joſephus calls the Elamites the founders of the Perſians: Aſhur, who was driven out of Shinar by Nimrod, afterwards ſettled in Aſſyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls *Arraphacitis*, a province of Aſſyria, though Joſephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river Mæander, remarkable for its windings, in Aſia Minor: and Aram, the father of the Syrians. Ham, the youngeſt ſon of Noah, had four ſons; *viz.* Cuſh, whoſe poſterity ſpread into the ſeveral parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them who inhabited Egypt and other parts of Africa: Phut, to whom Bochart aſſigns the remaining part of Africa, from the lake Tritonides to the Atlantic Ocean, called *Lybia*: and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin.

Dr Bryant has advanced a new hypotheſis on this ſubject, and ſupported it with his uſual acuteneſs and learning. He maintains, that the diſperſion as well as the confuſion of tongues was local, and limited to the inhabitants of the province of Babel; that the ſeparation and diſtribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the reſult of Divine appointment, occaſioned a general migration; and that all the families among the ſons of men were concerned in it. The houſe of Shem, from which the Meſſiah was to ſpring, was particularly regarded in this diſtribution; the portion of his children was near the place of ſeparation; they in general had Aſia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the ſons of Chus would not ſubmit to the divine diſpenſation; they went off under the conduct of Nimrod, and ſeem to have been for a long time in a roving ſtate. However, at laſt they arrived at the plains of Shinar; and having ejected Aſhur and his ſons, who were placed there by Divine appointment, ſeized his dominions, and laid there the foundation of a great monarchy. But afterwards fearing leſt they ſhould be divided and ſcattered abroad, they built the tower of Babel as a landmark to which they might repair; and probably to anſwer the purpoſes of an idolatrous temple, or high altar, dedicated to the hoſt of heaven, from which they were never long to be abſent. They only, *viz.* the ſons of Chus or the Cuthites, and their aſſociates from other families, who had been guilty of rebellion againſt divine authority, and of wicked ambition and tyranny, were puniſhed with the judgment of confounded ſpeech through a failure in labial utterance, and of the diſperſion recorded in Gen. x. 8, 9: in conſequence of which they were ſcattered abroad from this city and tower, without any certain place of deſtination. The Cuthites invaded Egypt or the land of Mizraim in its infant ſtate, ſeized the whole country, and held it for ſome ages in ſubjection; and they extended likewiſe to the Indies and Ganges, and ſtill farther into China and Japan. From them the province of Cuſhan or Goſhen in Egypt derived its name. Here they obtained the appellation of *royal ſhepherds;* and when they were by force driven out of the country, after having been in poſſeſſion of it for 260 or 280 years, the land which they had been obliged to quit was given to the Iſraelites, who were alſo denominated *ſhepherds*, but ſhould not be confounded with the former or the antecedent inhabitants of Goſhen.

DISPLAYED, in heraldry, is underſtood of the poſition of an eagle, or any other bird, when it is erect, with its wings expanded or ſpread forth.

DISPONDEE, in the Greek and Latin poetry, a double ſpondee or foot, conſiſting of four long ſyllables; as mǣcēnātēs, conclūdēntēs.

DISPOSITION, in Scots law, is that deed or writing which contains the ſcale or grant of any ſubject: when applied to heritable ſubjects, it in ſome caſes gets the name of *charter*, which differs from a diſpoſition in nothing elſe than a few immaterial forms.

DISPOSITION, in architecture, the juſt placing the ſeveral parts of an edifice according to their nature and office. See ARCHITECTURE, nº 31, &c.

DISPOSITION, in oratory. See ORATORY, Part I.

DISPOSITION, in painting. See PAINTING.

DISPOSITION, in human nature.—In every man there is ſomething original, that ſerves to diſtinguiſh him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, reſolute or timorous, cheerful or moroſe. This original bent, termed *diſpoſition*, muſt be diſtinguiſhed from a *principle:* the latter, ſignifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. *Propenſity* is a name common to both; for it ſignifies a principle as well as a diſpoſition.

DISQUISITION (from *dis* and *quero* "I inquire"), an inquiry into the nature, kinds, and circumſtances of any problem, queſtion, or topic; in order to gain a right notion of it, and to diſcourſe clearly about it.

DISSECTION, in anatomy, the cutting up a body with a view of examining the ſtructure and uſe of the parts. See ANATOMY.

Le Gendre obſerves, that the diſſection of a human body, even dead, was held a ſacrilege till the time of Francis I. And the ſame author aſſures us, he has ſeen a conſultation held by the divines of Salamanca, at the requeſt of Charles V. to ſettle the queſtion whether or no it were lawful in point of conſcience to diſſect a human body in order to learn the ſtructure thereof.

DISSEISIN, in law, an unlawful diſpoſſeſſing a perſon of his lands or tenements.

DISSEPIMENTUM, in botany, the name by which Linnæus denominates the partitions which in dry ſeed-veſſels, as capſules and pods (ſiliqua), divide the fruit internally into cells.

DISSENTERS, ſeparatiſts from the ſervice and worſhip of any eſtabliſhed church.

DISSIDENTS, a denomination applied in Poland to thoſe of the Lutheran, Calviniſtic, and Greek profeſſion. The king of Poland engages by the *pacta conventa* to tolerate them in the free exerciſe of their religion, but they have often had reaſon to complain of the violation of theſe promiſes. See (*Hiſtory of*) POLAND.

DISSIMILITUDE, unlikeneſs or want of ſimilitude. See the article RESEMBLANCE *and diſſimilitude*.

DISSIMULATION, in morals, the act of diſſembling, by fallacious appearances, or falſe pretenſions.

Good princes regard diſſimulation as a neceſſary vice; but tyrants conſider it as a virtue.

It is apparent that ſecrecy is often neceſſary, to oppoſe thoſe who may be willing to circumvent our lawful intentions. But the neceſſity of precaution would become very rare, were no enterprizes to be formed, but ſuch as could be avowed openly. The frankneſs with which we could then act, would engage people in our intereſts. Marſhal Biron would have ſaved his life, by dealing ingenuouſly with Henry IV.

With reſpect to diſſimulation, three things are to be obſerved; 1. That the characters of thoſe are not to be eſteemed, who are reſerved and cautious without diſtinction. 2. Not to make ſecrets of unimportant matters. 3. To conduct ourſelves in ſuch manner, as to have as few ſecrets as poſſible.

DISSIPATION, in phyſics, an inſenſible loſs or conſumption of the minute parts of the body; or that flux whereby they fly off, and are loſt.

Circle of DISSIPATION, in optics, is uſed for that circular ſpace upon the retina, which is taken up by one of the extreme pencils or rays iſſuing from an object.

DISSOLVENT, in general, whatever diſſolves or reduces a ſolid body into ſuch minute parts as to be ſuſtained in a fluid.

The principal diſſolvents for metals are aqua-regia and aqua-fortis; for ſalts, earths, and gums, water; for coral, and other alkaline ſubſtances, diſtilled vinegar or ſpirits of wine. Diſſolvents are the ſame with what the chemiſts call *menſtruums*. See the article MENSTRUUM.

Diſſolvent, Diſſolution.

Univerſal DISSOLVENT. See the article ALKAHEST.

DISSOLUTION, in phyſics: a diſcontinuation, or analyſis, of the ſtructure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous or heterogeneous.

Diſſolution, then, is a general name for all reductions of concrete bodies into their ſmalleſt parts, without any regard either to ſolidity or fluidity: though in the uſual acceptation of the word among authors, it is reſtrained to the reduction of ſolid bodies into a ſtate of fluidity; which is more properly expreſſed by *ſolution*, as a branch of *diſſolution*.

According to the opinion of Fr. Tertius de Lanis, Boerhaave, and ſome other learned men, the power or faculty of diſſolving is lodged in fire alone. See FIRE and HEAT.

According to this hypotheſis, other fluids commonly ſuppoſed diſſolvents, only produce their effect by means of the fiery ſpicula they abound with; and even air, which is judged a powerful menſtruum, owes all its force to the rays of light diffuſed therein.

Sir Iſaac Newton accounts for all diſſolutions, and the ſeveral phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of diſſolution furniſh a great part of the arguments and conſiderations whereby he proves the reality of that principle. The following is a ſpecimen of that great author's way of philoſophiſing on the ſubject of diſſolution.

"When ſalt of tartar diſſolves by lying in a moiſt place, is not this done by an attraction between the particles of the ſalt of tartar and thoſe of the water which float in the air in form of vapours? and why does not common ſalt, or ſalt-petre, or vitriol, do the like, but for want of ſuch an attraction? And when aqua-fortis, or ſpirit of vitriol, poured on ſteel-filings, diſſolves the filings with a great heat and ebullition; is not this heat and ebullition effected by a violent motion of the parts? and does not that motion argue, that the acid parts of the liquor ruſh towards the parts of the metal with violence, and run forcibly into its pores; till, getting between the utmoſt particles and the main maſs of metal, they looſen them therefrom, and ſet them at liberty to float off into the water? When a ſolution of iron in aqua-fortis diſſolves lapis calaminaris, and lets go the iron; or a ſolution of copper diſſolves iron immerſed in it, and lets go the copper; or a ſolution of mercury in aqua-fortis poured on iron, copper, tin, or lead, diſſolves the metal, and lets go the mercury; does not this argue, that the acid particles of the aqua-fortis are attracted more ſtrongly by the lapis calaminaris than by iron; by iron than by copper; by copper than by ſilver; and by iron, copper, tin, and lead, than by mercury? And is it not for the ſame reaſon, that iron requires more aqua-fortis to diſſolve it than copper, and copper more than the other metals; and that of all metals iron is diſſolved moſt eaſily, and is moſt apt to ruſt; and next after iron, copper? When aqua-fortis diſſolves ſilver, and not gold; and aqua-regia diſſolves gold, and not ſilver; may it not be ſaid, that aqua-fortis is ſubtile enough to penetrate the pores of gold as well as of ſilver, but wants the attractive force to give it entrance; and the ſame of aqua-regia and ſilver? And when metals are diſſolved in acid menſtruums, and the acids in conjunction with the metal act after a different manner, ſo as that the taſte of the compound is milder than that of the ſimples and ſometimes a ſweet one; is it not becauſe the acids adhere to the metallic particles, and thereby loſe much of their activity? And if the acid be in too ſmall a proportion to make the compound diſſoluble in water; will it not, by adhering ſtrongly to the metal, become unactive, and loſe its taſte, and the compound become a taſteleſs earth? for ſuch things as are not diſſoluble by the moiſture of the tongue are inſipid."

Diſſolution.

Dr Freind gives us a mechanical account of diſſolution, in the inſtance of ſalt diſſolved in water, which is the moſt ſimple operation that falls under this head. This motion he aſcribes to that attractive force, which is ſo very extenſive in natural philoſophy, that there is no kind of matter but what is under its influence. It may be obſerved, ſays he, that the corpuſcles of ſalts, which are the moſt ſimple of any, are withal very minute, and for their bulk very ſolid; and therefore exert a very ſtrong attractive force, which, *cæteris paribus*, is proportional to the quantity of matter. Hence it comes to paſs, that the particles of water are more ſtrongly attracted by the ſaline particles than they are by one another: the particles of water, therefore, cohering but looſely, and being eaſily moveable, approach the corpuſcles of ſalts, and run, as it were, into their embraces: and the motion of them is quicker or ſlower, according to their leſs or greater diſtances; the attractive force in all bodies being ſtrongeſt at the point of contact. Therefore, if ſalt be thrown into the middle of a diſh full of water, we ſhall find the aqueous particles which are in the middle of the diſh ſharp and pungent to the taſte, but the water upon the ſides of the veſſel almoſt inſipid; ſo that, when ſuch a motion once ariſes, the aqueous particles are carried with an equal force towards the ſalts, and the moment of them is to be eſtimated from the ratio of their weight and celerity conjunctly. By the force of this impulſe, they open to themſelves a paſſage into the pores of the ſalts, which are very numerous; and at length ſo break and divide their texture, that all coheſion of their parts is deſtroyed: hereupon, being ſeparated, and removed to a convenient diſtance from one another, they are diſperſed, and float here and there about the water.

The ſimple diſſolution of ſaline ſubſtances of every kind in water, may indeed be plauſibly enough explained on the hypotheſis of attraction; but where the diſſolution is attended with heat, the emiſſion of vapour, &c. it ſeems neceſſary to ſeek for ſome other principle than mere attraction to ſolve theſe phenomena. When diluted oil of vitriol, for inſtance, is poured upon iron-filings, a great quantity of vapour ariſes, which, if it was attempted to be confined, would certainly break the containing veſſel.—It is impoſſible to imagine any connection between attraction and the emiſſion of a vapour; and what is ſtill more unaccountable, this vapour is inflammable, though neither the oil of vitriol nor the iron are ſo by themſelves. Another very ſtrong objection againſt the hypotheſis of attraction may be derived from the phenomena of metallic diſſolutions in general; for they do not diſſolve completely in acids, as ſalts do in water. By diſſolution they are always decompoſed, and cannot be recovered in their proper form without a good deal of trouble. One metal, indeed, will very often precipitate another from an acid in its metalline form; but this is attended with the decompoſition of the ſecond metal; ſo that this can by no means be reckoned a fair experiment. But, whatever other method is uſed, the diſſolved metal is always recovered in form of an earthy powder, that we could ſcarcely imagine capable of ever becoming malleable, and aſſuming the ſplendid appearance of a metal. Now, if there was a ſtrong attraction between this and the acid, we might very juſtly conjecture, that the diſſolution happened by means of that attraction; but ſo far from this, after a metal has been diſſolved by any acid, and the calx has been ſeparated from it, it is always difficult, and very often impoſſible, to procure a diſſolution of the calx in the ſame acid. The action of the acid in this caſe ſeems not unlike that of fire upon wood or any other inflammable ſubſtance. Dry wood, thrown into the fire, burns and flames with great violence; but the ſame wood reduced to aſhes, inſtead of burning, extinguiſhes fire already kindled. In like manner, a piece of clear metal thrown into an acid, diſſolves with great violence: but the ſame metal, deprived of its phlogiſtic principle, and reduced to a calx, cannot be acted upon by acids, in whatever manner they are applied; at leaſt, not without the greateſt difficulty; and the more perfect the calx is, *i.e.* the more completely it is deprived of its inflammable principle, the greater the difficulty is of combining it afterwards with an acid.

Another thing in which the diſſolution of metals by an acid reſembles the burning of combuſtibles by fire is, that in both caſes there is a ſeparation of the principle of inflammability. In the caſe of oil of vitriol and iron-filings, this is exceedingly obvious; for there the vapour which ariſes from the mixture takes fire, and explodes with great vehemence. In all other caſes it is very eaſily proved; for the calx is always capable of being revived into metal by the addition of any ſubſtance containing phlogiſton. The calces prepared by fire, and by precipitation from acids, alſo reſemble one another ſo much, that in many caſes they are ſcarce to be diſtinguiſhed.

Theſe conſiderations ſeem to favour the hypotheſis of Dr Boerhaave; and much more does the following, namely, that almoſt all metallic ſolutions produce ſome degree of ſenſible heat. In ſome metals this is very conſiderable; but the greateſt heat producible by an aqueous ſolution of any ſubſtance is by diſſolving quicklime in the nitrous acid. The heat here greatly exceeds that of boiling water. In ſome diſſolutions of inflammable matters by a mixture of the vitriolic and nitrous acids, the heat is ſo great, that the whole mixture takes fire almoſt inſtantaneouſly. Hence the Boerhaavians think they have ſufficient grounds to conclude, that fire alone is the agent by which all diſſolutions are performed.

Theſe appearances have alſo been explained on the principles of attraction; and it has been ſaid, that the heat, &c. were owing to nothing but the violent action of the particles of the acid and metal upon each other. But the late diſcoveries made by Dr Black, with regard to heat, ſhow, that it is capable of remaining concealed in ſubſtances for any length of time, and afterwards breaking out in its proper form. It is probable, therefore, that the heat produced in theſe diſſolutions is no other than what exiſted before, either in the acid or in the metal. But for a full diſcuſſion of this ſubject ſee the articles COLD, CONGELATION, EVAPORATION, FIRE, HEAT, &c.

DISSONANCE, in muſic. See DISCORD.

DISSYLLABLE, among grammarians, a word conſiſting only of two ſyllables: ſuch are nature, ſcience, &c.

DISTAFF, an inſtrument about which flax is tied in order to be ſpun.

DISTANCE, in general, an internal between two things, either with regard to time or place. See METAPHYSICS.

Acceſſible DISTANCES, in geometry, are ſuch as may be meaſured by the chain, &c. See GEOMETRY.

Inacceſſible DISTANCES, are ſuch as cannot be meaſured by the chain, &c. by reaſon of ſome river, or the like, &c. which obſtructs our paſſing from one object to another. See GEOMETRY.

DISTANCE, in aſtronomy. The diſtance of the ſun, planets, and comets, is found only from their parallax, as it cannot be found either by eclipſes or their different phaſes: for from the theory of the motions of the earth and planets we know, at any time, the proportion of the diſtances of the ſun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to theſe diſtances. See ASTRONOMY.

DISTASTE properly ſignifies an averſion or diſlike to certain foods; and may be either conſtitutional, or owing to ſome diſorder of the ſtomach.

DISTEMPER, among phyſicians, the ſame with DISEASE.

DISTEMPER, in painting, a term uſed for the working up of colours with ſomething beſides water or oil. If the colours are prepared with water, that kind of painting is called *limning*; and if with oil, it is called *painting in oil*, and ſimply *painting*. If the colours are mixed with ſize, whites of eggs, or any ſuch proper glutinous or unctuous matter, and not with oil, then they ſay it is done in *diſtemper*.

DISTENSION, in general, ſignifies the ſtretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verſes making a complete ſenſe. Thus hexameter and pentameter verſes are diſpoſed in diſtichs. There are excellent morals in Cato's diſtichs.

DISTICHIASIS, in ſurgery, a diſeaſe of the eyelids, when under the ordinary eye-laſhes there grows another extraordinary row of hair, which frequently eradicates the former, and, pricking the membrane of the eye, excites pain, and brings on a defluxion.—It is cured by pulling out the ſecond row of hairs with nippers, and cauterizing the pores out of which they iſſued.

DISTILLATION. See CHEMISTRY, *Index*.

The objects of diſtillation, conſidered as a trade diſtinct from the other branches of chemiſtry, are chiefly ſpirituous liquors, and thoſe waters impregnated with the eſſential oil of plants, commonly called *ſimple diſtilled* waters. The diſtilling compound ſpirits and waters is reckoned a different branch of buſineſs, and they who deal in that way are commonly called *rectifiers*. This

1 Difference between diſtillers and rectifiers.

This difference, however, though it exiſts among commercial people, is not at all founded in the nature of the thing; compound ſpirits being made, and ſimple ſpirits being rectified, by the very ſame operations by which they are at firſt diſtilled, or at leaſt with very trifling alterations.

2
Spirits perfectly flavourleſs, how obtained.

The great object with every diſtiller ought to be, to procure a ſpirit perfectly flavourleſs, or at leaſt as well freed from any particular flavour as may be; and in this country the procuring of ſuch a ſpirit is no eaſy matter. The only materials for diſtillation that have been uſed in large quantity, are malt and molaſſes or treacle. Both of theſe, eſpecially the firſt, abound with an oily matter, which, riſing along with the ſpirit, communicates a diſagreeable flavour to it, and from which it can ſcarce be freed afterwards by any means whatever.—Some experiments have been made upon carrots, as a ſubject for the diſtillers: but theſe are not as yet ſufficiently deciſive; nor is it probable, that a ſpirit drawn from carrots would be at all devoid of flavour, more than one drawn from malt.—To diſſipate the eſſential oil which gives the diſagreeable flavour to malt ſpirits, it has been propoſed to inſpiſſate the wort into a rob, or thin extract like a ſyrup; afterwards to thin it with water, and ferment it in the uſual manner. This certainly promiſes great ſucceſs; there is no ſubject we know of that is poſſeſſed of any kind of eſſential oil, but what will part with it by diſtillation or by long boiling. The inſpiſſating of the wort, however, does not ſeem to be either neceſſary or ſafe to be attempted; for, in this caſe, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity loſt by evaporation, therefore, might be occaſionally added, with an equal certainty of diſſipating the obnoxious oil. Whether the yield of ſpirit would be as great in this caſe as in the other, is a queſtion that can by no means be diſcuſſed without further experiments.

3
Eſſential oil by ſome thought convertible into ſpirit.

According to a theory adopted by ſome diſtillers, namely, that eſſential oils are convertible into ardent ſpirits; and that the more oily any ſubject is, the greater quantity of ſpirit is obtainable from it; the practice of diſſipating the oil before fermentation muſt certainly be a loſs. But we are too little acquainted with the compoſition of vinous ſpirits, to have any juſt foundation for adopting ſuch theories. Beſides, it is certain, that the quantity of ardent ſpirit producible from any ſubſtance, malt for inſtance, very greatly exceeds the quantity of eſſential oil which can by any means be obtained from the ſame; nor do we find that thoſe ſubſtances, which abound moſt in eſſential oil, yield the greateſt quantity of ſpirits. So far from this, fine ſugar, which contains little or no eſſential oil, yields a great deal of ardent ſpirit.

4
Directions concerning fermentation.

Previous to the operation of diſtilling, thoſe of brewing and fermentation are neceſſary: but as theſe are fully treated of under the article Brewing, we ſhall here only obſerve, that unleſs the boiling of the wort, before fermentation, is found to diſſipate the eſſential oil, ſo as to take away the flavour of the malt, there is no neceſſity for being at the trouble of that operation. The wort may be immediately cooled and fermented.—The fermentation ought always to be carried on as ſlowly as poſſible, and performed in veſſels cloſely ſtopped; only having at the bung a valve preſſed down by a ſpring, which will yield with leſs force than is ſufficient to burſt the veſſel. It ſhould even be ſuffered to remain till it has become perfectly fine and tranſparent; as by this means the ſpirit will not only be ſuperior in quantity, but alſo in fragrance, pungency, and vinoſity, to that commonly produced.

5
For diſtillation.

With regard to performing the operation of diſtilling, there is only one general rule that can be given, namely, to let the heat, in all caſes, be as gentle as poſſible. Accidents will be effectually prevented by having the worm of a proper wideneſs, and by rectifying the ſpirits in a water-bath; which, if ſufficiently large, will perform the operation with all the diſpatch requiſite for the moſt extenſive buſineſs.—The veſſel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom, ſo that it may ſink in the water. Thus the operation will go on as quickly as if it was on an open fire, and without the leaſt danger of a miſcarriage; nor will it ever be neceſſary to make the water in the bath come to a boiling heat.

6
For rectification.

As the end of rectification is to make the ſpirit *clean* as well as *ſtrong*, or to deprive it of the eſſential oil as well as the aqueous part, it will be proper to have regard to this even in the firſt diſtillation. For this purpoſe, the ſpirit, as it firſt comes over, ſhould be received into a quantity of cold water; as by this means the connection betwixt it and the oily matter will be conſiderably leſſened. For the ſame reaſon, after it has been once rectified in the water-bath, it ſhould be again mixed with an equal quantity of water, and diſtilled a ſecond time. Thus the ſpirit will be freed from moſt of the oily matter, even though it hath been very much impregnated with it at firſt. It is neceſſary to obſerve, however, that by uſing ſuch a quantity of water, a conſiderable part of the water will be left in the reſiduum of each rectification. All theſe reſiduums, therefore, muſt be mixed together, and diſtilled on an open fire, with a briſk heat, that the remainder of the ſpirit may be got out.

After the ſpirit has been diſtilled once or twice in this manner from water, it may be diſtilled in a water-bath without any addition; and this laſt rectification will free it from moſt of the water it contains. But if it is required to be highly dephlegmated, a quantity of pure and dry ſalt of tartar muſt be added. The attraction betwixt this ſalt and water is greater than that betwixt water and ſpirit of wine. The ſalt therefore imbibes the water contained in the ſpirit, and ſinks with it to the bottom. The ſpirit, by a ſingle diſtillation, may then be rendered perfectly free from water; but there is great danger of ſome of the alkaline ſalt riſing along with it, and impregnating it with what is called an *urinous flavour*. When this once happens, it is impoſſible to be remedied; and the only way to prevent it is, to make the heat with which the ſpirit is diſtilled as gentle as poſſible. It hath been propoſed, indeed, to prevent the riſing of any thing alkaline, by the admixture of ſome calcined vitriol, ſal catharticus amarus, or other imperfect neutral ſalt; but this can ſcarce be ſuppoſed to anſwer any good purpoſe, as the alkali unites itſelf with the oily matter of the ſpirit, and forms a kind of ſaponaceous compound, which is not ſo eaſily affected by the acid of the vitriol or other ſalt, eſpecially as theſe ſalts will not diſſolve in the ſpirit itſelf.

7 Of imitating foreign ſpirits.

8 Method of making brandies in France.

One very great deſideratum among the diſtillers of this country is, a method of imitating the foreign ſpirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithſtanding the many attempts that are daily made for this purpoſe, the ſucceſs in general hath been but very indifferent. On this ſubject, Mr Cooper hath the following obſervations, in his Complete Syſtem of Diſtillation; which, as they are applicable to all other ſpirits as well as brandy, we ſhall here tranſcribe.—"The general method of diſtilling brandies in France need not be formally deſcribed, as it differs in nothing from that practiſed here in working from malt-waſh or molaſſes; nor are they in the leaſt more cleanly or exact in the operation. They only obſerve more particularly to throw in a little of the natural ley into the ſtill along with the wine, as finding this gives their ſpirit the flavour for which it is generally admired abroad.—But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every ſoil, every climate, every kind of grapes, varies with regard to the quantity and quality of the ſpirits extracted from them. There are ſome grapes which are only fit for eating; others for drying, as thoſe of Damaſcus, Corinth, Provence, and Avignon, but not fit to make wine.—Some wines are very proper for diſtillation, and others much leſs ſo. The wines of Languedoc and Provence afford a great deal of brandy by diſtillation, when the operation is performed on them in their full ſtrength. The Orleans wines, and thoſe of Blois, afford yet more: but the beſt are thoſe of the territories of Cogniac and Andaye; which are, however, in the number of thoſe the leaſt drunk in France. Whereas thoſe of Burgundy and Champagne, though of a very fine flavour, are improper, becauſe they yield but very little in diſtillation.

"It muſt alſo be farther obſerved, that all the wines for diſtillation, as thoſe of Spain, the Canaries, of Alicant, of Cyprus, of St Peres, of Toquet, of Grave, of Hungary, and others of the ſame kind, yield very little brandy by diſtillation; and conſequently would coſt the diſtiller conſiderably more than he could ſell it for. What is drawn from them is indeed very good, always retaining the ſaccharine quality and rich flavour of the wine from whence it is drawn; but as it grows old, this flavour often becomes aromatic, and is not agreeable to all palates.

"Hence we ſee that brandies always differ according as they are extracted from different ſpecies of grapes. Nor would there be ſo great a ſimilarity as there is between the different kinds of French brandies, were the ſtrongeſt wines uſed for this purpoſe: but this is rarely the caſe; the weakeſt and loweſt flavoured wines only are diſtilled for their ſpirit, or ſuch as prove abſolutely unfit for any other uſe.

"A large quantity of brandy is diſtilled in France during the time of the vintage; for all thoſe poor grapes that prove unfit for wine, are uſually firſt gathered, preſſed, their juice fermented, and directly diſtilled. This rids their hands of their poor wines at once, and leaves their caſks empty for the reception of better. It is a general rule with them not to diſtil wine that will fetch any price as wine; for, in this ſtate, the profits upon them are vaſtly greater than when reduced to brandies. This large ſtock of ſmall wines, with which they are almoſt over-run in France, ſufficiently accounts for their making ſuch vaſt quantities of brandy in that country, more than in others which lie in warmer climates and are much better adapted to the production of grapes.—Nor is this the only fund of their brandies: for all the wine that turns eager, is alſo condemned to the ſtill; and, in ſhort, all that they can neither export nor conſume at home, which amounts to a large quantity; ſince much of the wine laid in for their family proviſion is ſo poor as not to keep during the time of ſpending.

9 How brandy may be imitated in this country.

"Hence many of our Engliſh ſpirits, with proper management, are convertible into brandies that ſhall hardly be diſtinguiſhed from the foreign in many reſpects, provided the operation be neatly performed.

"The common method of rectifying ſpirits from alkaline ſalts, deſtroys their vinoſity, and in its ſtead introduces an urinous or lixivious taſte. But as it is abſolutely neceſſary to reſtore, or at leaſt to ſubſtitute in its room, ſome degree of vinoſity, ſeveral methods have been propoſed, and a multitude of experiments performed, in order to diſcover this great deſideratum. But none has ſucceeded equal to the ſpirit of nitre; and accordingly this ſpirit, either ſtrong or dulcified, has been uſed by moſt diſtillers to give an agreeable vinoſity to their ſpirits. Several difficulties, however, occur in the method of uſing it; the principal of which is, its being apt to quit the liquor in a ſhort time, and conſequently depriving the liquor of that vinoſity it was intended to give. In order to remove this difficulty, and prevent the vinoſity from quitting the goods, the dulcified ſpirit of nitre, which is much better than the ſtrong ſpirit, ſhould be prepared by a previous digeſtion, continued for ſome time, with alcohol; the longer the digeſtion is continued, the more intimately will they be blended, and the compound rendered the milder and ſofter.

After a proper digeſtion, the dulcified ſpirit ſhould be mixed with the brandy, by which the vinoſity will be intimately blended with the goods, and not diſpoſed to fly off for a very conſiderable time.—No general rule can be given for the quantity of this mineral acid requiſite to be employed; becauſe different proportions of it are neceſſary in different ſpirits. It ſhould, however, be carefully attended to, that though a ſmall quantity of it will undoubtedly give an agreeable vinoſity reſembling that naturally found in the fine ſubtile ſpirits drawn from wines, yet an over large doſe of it will not only cauſe a diſagreeable flavour, but alſo render the whole deſign abortive, by diſcovering the impoſition. Thoſe, therefore, who endeavour to cover a foul taſte in goods by large doſes of dulcified ſpirit of nitre, will find themſelves deceived.

"But the beſt, and indeed the only method of imitating French brandies to perfection, is by an eſſential oil of wine; this being the very thing that gives the French brandies their flavour. It muſt, however, be remembered, that, in order to uſe even this ingredient to advantage, a pure taſteleſs ſpirit muſt firſt be procured; for it is ridiculous to expect that this eſſential oil ſhould be able to give the agreeable flavour of French brandies to our fulſome malt ſpirit, already loaded with its own nauſeous oil, or ſtrongly impregnated with a lixivious taſte from the alkaline ſalts uſed in rectification. How a pure inſipid ſpirit may be obtained, has already been conſidered; it only therefore remains to ſhow the method of procuring this eſſential oil of wine, which is this:

"Take ſome cakes of dry wine-lees, ſuch as are uſed by our hatters, diſſolve them in ſix or eight times their weight of water, diſtil the liquor with a ſlow fire, and ſeparate the oil with a ſeparating glaſs; reſerving for the niceſt uſes only that which comes over firſt, the ſucceeding oil being coarſer and more reſinous.—Having procured this fine oil of wine, it may be mixed into a quinteſſence with pure alcohol; by which means it may be preſerved a long time fully poſſeſſed of all its flavour and virtues; but, without ſuch management, it will ſoon grow reſinous and rancid.

"When a fine eſſential oil of wine is thus procured, and alſo a pure and inſipid ſpirit, French brandies may be imitated to perfection, with regard to the flavour. It muſt, however, be remembered, and carefully adverted to, that the eſſential oil be drawn from the ſame kind of lees as the brandy to be imitated was procured from; we mean, in order to imitate Coniac brandy, it will be neceſſary to diſtil the eſſential oil from Coniac lees; and the ſame for any other kind of brandy. For, as different brandies have different flavours, and as theſe flavours are entirely owing to the eſſential oil of the grape, it would be prepoſterous to endeavour to imitate the flavour of Coniac brandy with an eſſential oil procured from the lees of Bourdeaux wine.—When the flavour of the brandy is well imitated by a proper doſe of the eſſential oil, and the whole reduced into one ſimple and homogeneous fluid, other difficulties are ſtill behind: The flavour, though the eſſential part, is not, however, the only one; the colour, the proof, and the ſoftneſs, muſt alſo be regarded, before a ſpirit that perfectly reſembles brandy can be procured. With regard to the proof, it may be eaſily hit, by uſing a ſpirit rectified above proof; which, after being intimately mixed with the eſſential oil of wine, may be let down to a proper ſtandard with fair water. And the ſoftneſs may, in a great meaſure, be obtained by diſtilling and rectifying the ſpirit with a gentle fire; and what is wanting of this criterion in the liquor when firſt made, will be ſupplied by time: for it muſt be remembered, that it is time alone that gives this property to French brandies; they being at firſt acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection.

10 Spirits how coloured.

"The art of colouring ſpirits owes its riſe to obſervations on foreign brandies. A piece of French brandy that has acquired by age a great degree of ſoftneſs and ripeneſs, is obſerved at the ſame time to have acquired a yellowiſh brown colour; and hence our diſtillers have endeavoured to imitate this colour in ſuch ſpirits as are intended to paſs for French brandy. And in order to this, a great variety of experiments have been made on different ſubſtances. But in order to know a direct and ſure method of imitating this colour to perfection, it is neceſſary we ſhould be informed whence the French brandies themſelves acquire their colour. This diſcovery is very eaſily made. The common experiment of trying whether brandy will turn blackiſh with a ſolution of iron, ſhows that the colour is owing to ſome of the reſinous matter of the oak-caſk diſſolved in the ſpirit. There can be no difficulty, therefore, in imitating this colour to perfection. A ſmall quantity of the extract of oak, or the ſhavings of that wood, properly digeſted, will furniſh us with a tincture capable of giving the ſpirit any degree of colour required. But it muſt be remembered, that as the tincture is extracted from the caſk by brandy, that is, alcohol and water, it is neceſſary to uſe both in extracting the tincture; for each of theſe diſſolves different parts of the wood. Let, therefore, a ſufficient quantity of oak ſhavings be digeſted in ſtrong ſpirit of wine, and alſo at the ſame time other oak-ſhavings be digeſted in water; and when the liquors have acquired a ſtrong tincture from the oak, let both be poured off from the ſhavings into different veſſels, and both placed over a gentle fire till reduced to the conſiſtence of treacle. In this condition let the two extracts be intimately mixed together; which may be effectually done by adding a ſmall quantity of loaf-ſugar, in fine powder, and rubbing the whole well together. By this means a liquid eſſential extract of oak will be procured, and always ready to be uſed as occaſion ſhall require.

"There are other methods in uſe for colouring brandies; but the beſt, beſides the extract of oak above mentioned, are treacle and burnt ſugar. The treacle gives the ſpirit a fine colour, nearly reſembling that of French brandy; but as its colour is dilute, a large quantity muſt be uſed: this is not, however, attended with any bad conſequences; for notwithſtanding the ſpirit is really weakened by this addition, yet the bubble proof, the general criterion of ſpirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The ſpirit alſo acquires from the mixture a ſweetiſh or luſcious taſte, and a fullneſs in the mouth; both which properties render it very agreeable to the palates of the common people, who are in fact the principal conſumers of theſe ſpirits. A much ſmaller quantity of burnt ſugar than of treacle will be ſufficient for colouring the ſame quantity of ſpirits: the taſte is alſo very different; for inſtead of the ſweetneſs imparted by the treacle, the ſpirit acquires from the burnt ſugar an agreeable bitterneſs, and by that means recommends itſelf to nicer palates, which are offended with a luſcious ſpirit. The burnt ſugar is prepared by diſſolving a proper quantity of ſugar in a little water, and ſcorching it over the fire till it acquires a black colour. Either treacle or burnt ſugar will nearly imitate the genuine colour of old French brandy; but neither of them will ſucceed when put to the teſt of the vitriolic ſolution.

"The ſpirit diſtilled from molaſſes or treacle is very clean or pure. It is made from common treacle diſſolved in water, and fermented in the ſame manner as the waſh for the common malt ſpirit. But if ſome particular art is not uſed in diſtilling this ſpirit, it will not prove ſo vinous as malt ſpirit, but more flat and leſs pungent and acid, though otherwiſe much cleaner taſted, as its eſſential oil is of a much leſs offenſive flavour. Therefore, if good freſh wine lees, abounding in tartar, be added and duly fermented with the molaſſes, the ſpirit will acquire a much greater vinoſity and briſkneſs, and approach much nearer to the nature of foreign ſpirits. Where the molaſſes ſpirit is brought to the common proof-ſtrength, if it is found not to have a ſufficient vinoſity, it will be very proper to add ſome good dulcified ſpirit of nitre; and if the ſpirit be clean worked, it may, by this addition only, be made to paſs on ordinary judges for French brandy. Great quantities of this ſpirit are uſed in adulterating foreign brandy, rum, and arrack. Much of it is alſo uſed alone in making cherry-brandy and other drams by infuſion; in all which many, and perhaps with juſtice, prefer it to foreign brandies. Molaſſes, like all other ſpirits, is entirely colourleſs when firſt extracted; but diſtillers always give it as nearly as poſſible the colour of foreign ſpirits."

11 Rum how imitated.

12 Raiſins the beſt material for procuring pure ſpirit.

If theſe principles hold good, the imitation of foreign ſpirits of all kinds muſt be an eaſy matter. It will only coſt the procuring of ſome of thoſe ſubſtances from which the ſpirit is drawn; and diſtilling this with water, the eſſential oil will always give the flavour deſired. Thus, to imitate Jamaica rum, it will only be neceſſary to procure ſome of the tops, or other uſeleſs parts, of the ſugar-canes; from which an eſſential oil being drawn, and mixed with clean molaſſes ſpirit, will give it the true flavour. The principal difficulty muſt lie in procuring a ſpirit totally, or nearly, free of all flavour of its own. The ſpirit drawn from the refuſe of a ſugar-houſe is by our author commended as ſuperior to that drawn from molaſſes: though even this is not entirely devoid of ſome kind of flavour of its own; nor indeed is that drawn from the beſt refined ſugar entirely flavourleſs. It is very probable, therefore, that to procure an abſolutely flavourleſs ſpirit is impoſſible. The only method, therefore, of imitating foreign ſpirits is, by chooſing ſuch materials as will yield a ſpirit flavoured as much like them as poſſible. The materials moſt recommended by our author in this caſe, and probably the beſt that can be uſed, are raiſins. Concerning theſe he gives the following directions: "In order to extract this ſpirit, the raiſins muſt be infuſed in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the ſtill, and the ſpirit extracted by a ſtrong fire. The reaſon why we here direct a ſtrong fire is, becauſe by that means a greater quantity of the eſſential oil will come over the helm with the ſpirit, which will render it fitter for the diſtiller's purpoſe: for this ſpirit is commonly uſed to mix with common malt goods: and it is ſurpriſing how far it will go in this reſpect, ten gallons of it being often ſufficient to give a determining flavour and agreeable vinoſity to a whole piece of malt ſpirits. It is therefore well worth the diſtiller's while to endeavour at improving the common method of extracting ſpirits from raiſins; and perhaps the following hint may merit attention. When the fermentation is completed, and the ſtill charged with fermented liquor as above directed, let the whole be drawn off with as briſk a fire as poſſible; but, inſtead of the caſk or can generally uſed by diſtillers for a receiver, let a large glaſs, called by chemiſts a *ſeparating glaſs*, be placed under the noſe of the worm, and a common receiver applied to the ſpout of the ſeparating glaſs: by this means the eſſential oil will ſwim upon the top of the ſpirit, or rather low wine, in the ſeparating glaſs, and may be eaſily preſerved at the end of the operation. The uſe of this limpid eſſential oil is well known to diſtillers; for in this reſides the whole flavour, and conſequently may be uſed to the greateſt advantage in giving that diſtinguiſhing taſte and true vinoſity to the common malt ſpirits. After the oil is ſeparated from the low-wine, the liquor may be rectified in balneo mariæ into a pure and almoſt taſteleſs ſpirit, and therefore well adapted to make the fineſt compound cordials, or to imitate or mix with the fineſt French brandies, arracks, &c. In the ſame manner a ſpirit may be obtained from cyder. But as its particular flavour is not ſo deſirable as that obtained from raiſins, it ſhould be diſtilled in a more gentle manner, and carefully rectified according to the directions we have already given."

13 Directions for diſtilling compound ſpirits.

Theſe directions may ſuffice for the diſtillation of any kind of ſimple ſpirits. The diſtillation of compound ones depends on the obſervation of the following general rules, which are very eaſy to be learned and practiſed.

1. The artiſt muſt always be careful to uſe a well cleanſed ſpirit, or one freed from its own eſſential oil. For, as a compound water is nothing more than a ſpirit impregnated with the eſſential oil of the ingredients, it is neceſſary that the ſpirit ſhould have depoſited its own.

2. Let the time of previous digeſtion be proportioned to the tenacity of the ingredients, or the ponderoſity of their oil.

3. Let the ſtrength of the fire alſo be proportioned to the ponderoſity of the oil intended to be raiſed with the ſpirit.

4. Let only a due proportion of the fineſt parts of the eſſential oil be united with the ſpirit; the groſſer and leſs fragrant parts of the oil not giving the ſpirit ſo agreeable a flavour, and at the ſame time rendering it unſightly. This may in a great meaſure be effected by leaving out the faints, and making up to proof with fine ſoft water in their ſtead.

A careful obſervation of theſe four rules will render this part of diſtillation much more perfect than it is at preſent. Nor will there be any occaſion for the uſe of burnt alum, white of eggs, iſinglaſs, &c. to fine down cordial waters; for they will preſently be fine, ſweet and pleaſant taſted, without any further trouble. We ſhall now ſubjoin particular receipts for making ſome of thoſe compound waters, or ſpirits, that are moſt commonly to be met with, and are in the moſt general eſtimation.

14 Receipts for a number of compound ſpirits.

Strong Cinnamon-water. Take eight pounds of fine cinnamon bruiſed, 17 gallons of clean rectified ſpirit, and two gallons of water. Put them into your ſtill, and digeſt them 24 hours with a gentle heat; after which draw off 16 gallons with a pretty ſtrong heat.—A cheaper ſpirit, but of an inferior quality, may be obtained by uſing caſſia lignea inſtead of cinnamon. If you would dulcify your cinnamon water, take double-refined ſugar in what quantity you pleaſe; the general proportion is about two pounds to a gallon; and diſſolve it in the ſpirit, after you have made it up proof with clean water. One general caution is here neceſſary to be added; namely, that near the end of the operation, you carefully watch the ſpirit as it runs into the receiver, in order to prevent the faints from mixing with the goods. This you may diſcover by often catching ſome of it as it runs from the worm in a glaſs, and obſerving whether it is fine and tranſparent; for as ſoon as ever the faints begin to riſe, the ſpirit will have an azure or bluiſh caſt. As ſoon as this altera-

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tion in colour is perceived, the receiver muſt be immediately changed; for if the faints are ſuffered to mix themſelves with the reſt, the value of the goods will be greatly leſſened.—Here we may obſerve, that the diſtillers call ſuch goods as are made up proof, *double goods;* and thoſe below proof, *ſingle*.

Clove-water. Take of cloves bruiſed, four pounds; pimento, or all-ſpice, half a pound; proof-ſpirit, 16 gallons. Digeſt the mixture 12 hours in a gentle heat, and then draw off 15 gallons with a pretty briſk fire. The water may be coloured red, either by a ſtrong tincture of cochineal, alkanet, or corn-poppy flowers. It may be dulcified at pleaſure with double refined ſugar.

Lemon-water. Take of dried lemon-peel, four pounds; clean proof ſpirit 10 gallons and a half, and one gallon of water. Draw off 10 gallons by a gentle fire, and dulcify with fine ſugar.

Citron-water. Take of dry yellow rhinds of citrons, three pounds; of orange-peel, two pounds; nutmegs bruiſed, three quarters of a pound; clean proof-ſpirit, ten gallons and a half; water, one gallon: digeſt with a gentle heat; then draw off ten gallons in balneo mariæ, and dulcify with fine ſugar.

Aniſeed-water. Take of aniſeed bruiſed, two pounds; proof-ſpirit, 12 gallons and a half; water, one gallon: draw off ten gallons with a moderate fire.—This water ſhould never be reduced below proof; becauſe the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there is a neceſſity for doing this, their tranſparency may be reſtored by filtration.

Orange-water. Take of the yellow part of freſh orange-peel, five pounds; clean proof-ſpirit, ten gallons and a half; water, two gallons: draw off ten gallons with a gentle fire.

Cedrat-water. The cedrat is a ſpecies of citron, and very highly eſteemed in Italy where it grows naturally. The fruit is difficult to be procured in this country; but as the eſſential oil is often imported from Italy, it may be made with it according to the following receipt.—Take of the fineſt loaf-ſugar reduced to powder, a quarter of a pound; put it into a glaſs mortar, with 120 drops of the eſſence of cedrat; rub them together with a glaſs peſtle; and put them into a glaſs alembic, with a gallon of fine proof-ſpirits and a quart of water. Place the alembic in balneo mariæ, and draw off one gallon, or till the faints begin to riſe; and dulcify with fine ſugar. This is reckoned the fineſt cordial yet known; it will therefore be neceſſary to be particularly careful that the ſpirit is perfectly clean, and, as much as poſſible, freed from any flavour of its own.

Orange Cordial-water, or *Eau de Bigarade*. Take the outer or yellow part of the peels of 14 bigarades, (a kind of oranges); half an ounce of nutmegs, a quarter of an ounce of mace, a gallon of fine proof-ſpirit, and two quarts of water. Digeſt all theſe together two days in a cloſe veſſel; after which draw off a gallon with a gentle fire, and dulcify with fine ſugar. This cordial is greatly eſteemed abroad, but is not ſo well known in this country.

Ros Solis. Take of the herb called *Ros Solis*, picked clean, four pounds; cinnamon, cloves, and nutmegs, of each three ounces and a half; marigold-flowers, one pound; caraway-ſeeds, ten ounces; proof-ſpirit, ten gallons; water, three gallons. Diſtil with a pretty ſtrong fire, till the faints begin to riſe. Then take of liquorice-root ſliced, half a pound; raiſins ſtoned, two pounds; red ſaunders, half a pound: digeſt theſe three days in two quarts of water; then ſtrain out the clear liquor, in which diſſolve three pounds of fine ſugar, and mix it with the ſpirit drawn by diſtillation.

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Uſquebaugh. Take nutmegs, cloves, and cinnamon, of each two ounces; the ſeeds of aniſe, caraway, and coriander, of each four ounces; of liquorice-root ſliced, half a pound. Bruiſe the ſeeds and ſpices; and put them, together with the liquorice, into the ſtill with 11 gallons of proof-ſpirits, and two gallons of water. Diſtil with a pretty briſk fire till the faints begin to riſe. But, as ſoon as the ſtill begins to work, faſten to the noſe of the worm two ounces of Engliſh ſaffron tied up in a cloth, that the liquor may run thro' it, and extract all its tincture; and in order to this, you ſhould frequently preſs the ſaffron with your fingers. When the operation is finiſhed, dulcify your goods with fine ſugar.

Ratafia. Is a liquor prepared from different kinds of fruits, and is of different colours according to the fruits made uſe of. Of red ratafia there are three kinds, the fine, the dry or ſharp, and the common. The fruits moſt proper for making red ratafia, are the black heart-cherry, the common red cherry, the black cherry, the mery or honey cherry, the ſtrawberry, the raſpberry, the red gooſeberry, and the mulberry. Theſe fruits ſhould be gathered when in their greateſt perfection, and the largeſt and moſt beautiful of them choſen for the purpoſe.—The following is a receipt for making red ratafia, fine and ſoft. Take of the black heart-cherries 24 pounds; black cherries, four pounds; raſpberries and ſtrawberries, of each three pounds. Pick the fruits from their ſtalks, and bruiſe them; in which ſtate let them continue 12 hours: preſs out the juice; and to every pint of it add a quarter of a pound of ſugar. When the ſugar is diſſolved, run the whole through the filtrating bag, and add to it three quarts of clean proof-ſpirits. Then take of cinnamon, four ounces; of mace, one ounce; and of cloves, two drams. Bruiſe theſe ſpices; put them into an alembic with a gallon of clean proof-ſpirits and two quarts of water, and draw off a gallon with a briſk fire. Add as much of this ſpicy ſpirit to your ratafia as will render it agreeable to your palate; about one fourth is the uſual proportion.

Ratafia made according to the above receipt will be of a very rich flavour and elegant colour. It may be rendered more or leſs of a ſpicy flavour, by adding or diminiſhing the quantity of ſpirit diſtilled from the ſpices.—Some, in making ratafia, ſuffer the expreſſed juices of their fruits to ferment ſeveral days: by this means the vinoſity of the ratafia is increaſed; but, at the ſame time, the elegant flavour of the fruits is greatly diminiſhed. Therefore, if the ratafia is deſired ſtronger or more vinous, it may be done by adding more ſpirits to the expreſſed juice; by which means the flavour of the fruits may be preſerved, as well as the ratafia rendered ſtronger. It is alſo a method with ſome to tie the ſpices in a linen bag, and ſuſpend them in the rataſia. But if this method is taken, it will be neceſſary to augment the quantity of ſpirit firſt added to the expreſſed juice. There is no great difference in the two methods of adding the ſpices, except that by ſuſpending them in the ratafia the liquor is rendered leſs tranſparent.

Dry or ſharp Ratafia. Take cherries and gooſeberries, of each 30 pounds; mulberries, ſeven pounds; raſpberries, ten pounds. Pick all theſe fruits clean from their ſtalks, &c. bruiſe them, and let them ſtand 12 hours; but do not ſuffer them to ferment. Preſs out the juice, and to every pint add three ounces of ſugar. When the ſugar is diſſolved, run it through the filtrating bag, and to every five pints of liquor add four pints of clean proof-ſpirit; together with the ſame proportion of ſpirit drawn from the ſpices in the foregoing compoſition.

Common Ratafia. Take of nutmegs, eight ounces; bitter almonds, ten pounds; Liſbon ſugar, eight pounds; ambergreaſe, ten grains: infuſe theſe ingredients three days in ten gallons of clean proof-ſpirit, and filter thro' a flannel bag for uſe. The nutmegs and bitter almonds muſt be bruiſed, and the ambergreaſe rubbed with the Liſbon ſugar in a marble mortar, before they are infuſed in the ſpirit.

Gold Cordial. Take of the roots of angelica, four pounds; raiſins ſtoned, two pounds; coriander ſeeds, half a pound; caraway-ſeeds and cinnamon, of each half a pound; cloves, two ounces; figs and liquorice-root, of each one pound; proof-ſpirit, eleven gallons; water, two gallons. The angelica, liquorice, and figs, muſt be ſliced before they are added. Digeſt two days; and draw off by a gentle heat till the faints begin to riſe; hanging in a piece of linen, faſtened to the mouth of the worm, an ounce of Engliſh ſaffron. Then diſſolve eight pounds of ſugar in three quarts of roſe-water, and add to it the diſtilled liquor.—This liquor derives its name of *Gold Cordial,* from a quantity of leaf-gold being formerly added to it; but this is now generally diſuſed, as it cannot poſſibly add any virtue.

Cardamum, or *All-fours.* Take of pimento, caraway, and coriander ſeeds, and lemon-peel, each three pounds; of malt ſpirits, eleven gallons; water, three gallons. Draw off with a gentle fire, dulcify with common ſugar, and make up to the ſtrength deſired with clear water.—This is a dram greatly uſed by the poorer ſort of people in ſome countries.

Geneva. There was formerly ſold in the apothecaries ſhops a diſtilled ſpirituous water of juniper; but the vulgar being fond of it as a dram, the diſtillers ſupplanted the apothecaries, and ſold it under the name of *Geneva.* The common kind, however, is not made from juniper-berries, but from oil of turpentine; and indeed it is ſurpriſing, that people ſhould accuſtom themſelves to drink ſuch liquors for pleaſure.—The receipt for making this kind of ſpirit, ſold in the gin-ſhops at London, is as follows. Take of the ordinary malt-ſpirits, ten gallons; oil of turpentine, two ounces; bay-ſalt, three handfuls. Draw off by a gentle fire till the faints begin to riſe; and make up your goods to the ſtrength required with clear water.

The beſt kind is made by the following recipe.—Take of juniper-berries, three pounds; proof-ſpirit, ten gallons; water, four gallons: Draw off by a gentle fire till the faints begin to riſe, and make up your goods to the ſtrength required with clean water.

There is a ſort of this liquor called *Hollands Geneva,* from its being imported from Holland, which is greatly eſteemed.—The ingredients uſed by the Dutch are the ſame with thoſe given in the laſt recipe; only, inſtead of malt-ſpirits, they uſe French brandy. But from what has been already obſerved concerning the nature of theſe kind of ſpirits, it is eaſy to ſee, that by the help of a well rectified ſpirit, geneva may be made in this country at leaſt nearly equal to the Dutch, provided it is kept to a proper age; for all ſpirituous liquors contract a ſoftneſs and mellowneſs by age, impoſſible to be imitated any other way.

DISTILLERY, the art of diſtilling brandy and other ſpirits. This art was firſt brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are ſaid to have practiſed it in the reign of the emperor Diocleſian, though it was unknown to the ancient Greeks and Romans. See DISTILLATION, and FERMENTATION.

DISTINCTION, in logic, is an aſſemblage of two or more words, whereby diſparate things, or their conceptions, are denoted.

DISTORTION, in medicine, is when any part of the human body remarkably deviates from its natural ſhape or poſition. Diſtortions of different parts may ariſe either from a convulſion or palſy; though ſometimes a terrible diſtortion in the ſhape of the whole body hath ariſen merely from careleſſneſs and ill habits. Mr Winſlow, in the Memoirs of the Academy of Sciences at Paris, gives a very remarkable account of a lady of quality, whom he had known to be perfectly ſtraight for ſeveral years; but who taking afterwards to a ſedentary courſe of life, got a cuſtom of dreſſing herſelf very careleſsly, and of leaning as ſhe ſat, either forwards or to a ſide. It was not many months before ſhe found it painful and troubleſome to ſtand or ſit upright; and ſoon afterwards ſhe found an inequality in the lower part of the back-bone. Alarmed at this, ſhe conſulted the gentleman who gave the account. To prevent the increaſe of the malady, he ordered her to wear a particular ſort of jumps inſtead of ſtays, and had a pad of a proper ſize applied: but this was ſoon neglected; and the conſequence was, that in a little time the back-bone became more and more crooked, and at length bent itſelf ſidewiſe in two contrary directions, ſo as to repreſent the figure of the Roman S; and the lady, ſtill refuſing to take the proper meaſures, loſt a fourth part of her height; and continued for the remainder of her life, not only crooked from right to left and from left to right, but ſo oddly folded together, that the firſt of the falſe ribs on one ſide approached very near the creſt of the os ilium on that ſide, and the viſcera of the lower belly became ſtrangely puſhed out of their regular places to the oppoſite ſide; and the ſtomach itſelf was ſo ſtrongly compreſſed, that whatever ſhe ſwallowed ſeemed to her to fall into two ſeparate cavities.

DISTRESS, in its ordinary acceptation, denotes calamity, miſery, or painful ſuffering.

The Contemplation of DISTRESS, *a ſource of pleaſure.* On this ſubject we have a very pleaſing and ingenious eſſay by Dr Barnes, in the Memoirs of the Literary and Philoſophical Society of Mancheſter *. It is introduced with the following motto:

Suave mari magno, turbantibus æquora ventis,
E terrâ alterius magnum ſpectare periclum.
Non quia vexari quenquam eſt jucunda voluptas;
Sed quibus ipſe malis careas, quia cernere ſuave eſt.
LUCRETIUS.

" The pleaſure here deſcribed by the poet, and of which he has mentioned ſo ſtriking and appoſite an inſtance, may perhaps at firſt ſeem of ſo ſingular and aſtoniſhing a nature, that ſome may be diſpoſed to doubt of its exiſtence. But that it does exiſt, in the caſe here referred to, and in many others of a ſimilar kind, is an undoubted fact; and it may not appear an uſeleſs or diſagreeable entertainment, to trace its ſource in the human breaſt, together with the final cauſe for which it was implanted there by our benevolent Creator.

" Shall I, it may be ſaid, feel complacency in beholding a ſcene in which many of my fellow-creatures are agonizing with terror, whilſt I can neither diminiſh their danger, nor, by my ſympathy, divide their anguiſh? At the ſight of another's wo, does not my boſom naturally feel pain? Do I not ſhare in his ſenſations? And is not this ſtrong and exquiſite ſenſibility intended by my Maker to urge me on to active and immediate aſſiſtance? Theſe ſenſations are indeed attended with a noble pleaſure, when I can, by friendly attention, or by benevolent communication, ſoothe the ſorrows of the poor mourner, ſnatch him from impending danger, or ſupply his preſſing wants. But in general, where my ſympathy is of no avail to the wretched ſufferer, I fly from the ſpectacle of his miſery, unable or unwilling to endure a pain which is not allayed by the ſweet ſatisfaction of doing good."

It will be neceſſary, in anſwer to theſe objections, in the firſt place to prove the reality of the feeling, the cauſe of which, in the human conſtitution, we here attempt to explore.

Mr Addiſon, in his beautiful papers on the Pleaſures of the Imagination, has obſerved, " that objects or ſcenes, which, when real, give diſguſt or pain, in deſcription often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleaſure and entertainment. Scenes of this nature, dignified by apt and ſtriking deſcription, we regard with ſomething of the ſame feelings with which we look upon a dead monſter.

———————*Informe cadaver*
Protrahitur: nequeunt expleri corda tuendo
Terribiles oculos, vultum, villoſaque ſetis
Pectora ſemiferi, atque extinctos faucibus ignes. VIRGIL.

" This (he obſerves) is more particularly the caſe, where the deſcription raiſes a ferment in the mind and works with violence upon the paſſions. One would wonder (adds he) how it comes to paſs, that paſſions, which are very unpleaſant at all other times, are very agreeable when excited by proper deſcription; ſuch as terror, dejection, grief, &c. This pleaſure ariſes from the reflection we make upon ourſelves, whilſt reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleaſure does not riſe ſo properly from the grief which theſe melancholy deſcriptions give us, as from the ſecret compariſon we make of ourſelves with thoſe who ſuffer. We ſhould not feel the ſame kind of pleaſure, if we actually ſaw a perſon lying under the tortures that we meet with in a deſcription."

And yet, upon the principle aſſigned by this amiable writer, we might feel the ſame, or even higher pleaſure, from the actual view of diſtreſs, than from any deſcription; becauſe the compariſon of ourſelves with the ſufferer would be more vivid, and conſequently the feeling more intenſe. We would only obſerve, that the cauſe which he aſſigns for this pleaſure is the very ſame with that aſſigned by Lucretius in our motto. Mr Addiſon applies it to the deſcription; the poet, to the actual contemplation of affecting ſcenes. In both the pleaſure is ſuppoſed to originate in ſelfiſhneſs. But wherever the ſocial paſſions are deeply intereſted, as they are here ſuppoſed to be, from the pathetic deſcription, or the ſtill more pathetic ſurvey, of the ſufferings of another, the ſympathetic feelings will of themſelves, at once, and previouſly to all reflection, become a ſource of agreeable and tender emotions. They will thus dignify and enhance the ſatisfaction, if any ſuch be felt, ariſing merely from the conſideration of our own perſonal ſecurity. And the more entirely we enter into the ſcene, by loſing all ideas of its being either paſt or fabulous, the more perfectly we forget ourſelves, and are abſorbed in the feeling,—the more exquiſite is the ſenſation.

But as our ſubſequent ſpeculations will chiefly turn upon the pleaſure derived from real ſcenes of calamity, and not from thoſe which are imaginary, it may be expected that we produce inſtances in proof that ſuch pleaſure is felt by perſons very different in their taſte and mental cultivation.

We ſhall not mention the horrid joy with which the ſavage feaſts his eye upon the agonies and contortions of his expiring priſoner—expiring in all the pains which artificial cruelty can inflict! Nor will we recur to the almoſt equally ſavage ſons of ancient Rome, when the majeſty of the Roman people could ruſh, with eagerneſs and tranſport, to behold hundreds of gladiators contending in fatal conflict, and probably more than half the number extended, weltering in blood and writhing in agony, upon the plain. Nor will we mention the Spaniſh bull-feaſts; nor the fervent acclamations of an Engliſh mob around their fellow-creatures, when engaged in furious battle, in which it is poſſible that ſome of the combatants may receive a mortal blow, and be hurried in this awful ſtate to the bar of his Judge. Let us ſurvey the multitudes which, in every part of the kingdom, always attend an execution. It may perhaps be ſaid, that in all places the vulgar have little of the ſenſibility and tenderneſs of more poliſhed boſoms. But, in the laſt mentioned inſtance, an execution, there is no exultation in the ſufferings of the poor criminal. He is regarded by every eye with the moſt melting compaſſion. The whole aſſembly ſympathizes with him in his unhappy ſituation. An awful ſtillneſs prevails at the dreadful moment. Many are wrung with unutterable ſenſations; and prayer and ſilence declare, more loudly than any language could, the intereſt they feel in his diſtreſs. Should a reprieve come to reſcue him from death, how great is the general triumph and congratulation! And probably in this multitude you will find not the mere vulgar herd alone, but the man of ſuperior knowledge and of more refined ſenſibility; who, led by ſome ſtrong principle, which we wiſh to explain, feels a pleaſure greater than all the pain, great and exquiſite as one ſhould imagine it to be, from ſuch a ſpectacle.

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* Vol. I. p. 144, &c.

The man who condemns many of the ſcenes we have already mentioned as barbarous and ſhocking, would probably run with the greateſt eagerneſs to ſome high cliff, overhanging the ocean, to ſee it ſwelled into a tempeſt, though a poor veſſel, or even a fleet of veſſels, were to appear as one part of the dreadful ſcenery, now lifted to the heavens on the foaming ſurge, now plunged deep into the fathomleſs abyſs, and now daſhed upon the rocks, where they are in a moment ſhivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the queſtion a little; Who would not be forward to ſtand ſafe, on the top of ſome mountain or tower, adjoining to a field of battle, in which two armies meet in deſperate conflict, though probably thouſands may ſoon lie before him proſtrate on the ground, and the whole field preſent the moſt horrid ſcenes of carnage and deſolation?

That in all theſe caſes pleaſure predominates in the compounded feeling, is plain from hence, becauſe you continue to ſurvey the ſcene; whereas when pain became the ſtronger ſenſation, you would certainly retire.

Cultivation may indeed have produced ſome minuter differences in the taſte and feelings of different minds. Thoſe whoſe ſenſibilities have not been refined by education or ſcience, may feel the pleaſure in a more groſs and brutal form. But do not the moſt poliſhed natures feel a ſimilar, a kindred pleaſure, in the deep-wrought diſtreſſes of the well-imagined ſcene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings or extort the tear. And the deeper and more tragical the ſcene becomes, the more it agitates the ſeveral paſſions of terror, grief, or pity—the more intenſely it delights, even the moſt poliſhed minds. They ſeem to enjoy the various and vivid emotions of contending paſſions. They love to have the tear trembling in the eye, and to feel the whole ſoul wrapt in thrilling ſenſations. For that moment they ſeem to forget the fiction; and afterwards commend that exhibition moſt, in which they moſt entirely loſt ſight of the author, and of their own ſituation, and were alive to all the unutterable vibrations of ſtrong or melting ſenſibility.

Taking it then for granted, that in the contemplation of many ſcenes of diſtreſs, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning ſome of thoſe principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr Akenſide, with his accuſtomed ſtrength and brilliancy of colouring, deſcribes and accounts for it in the following manner.

———————" Behold the ways
Of heaven's eternal deſtiny to man!
For ever juſt, benevolent, and wiſe!
That Virtue's awful ſteps, howe'er purſued
By vexing fortune, and intruſive pain.
Should never be divided from, her chaſte,
Her fair attendant, Pleaſure. Need I urge
Thy tardy thought, through all the various round
Of this exiſtence, that thy ſoftening ſoul
At length may learn, what energy the hand
Of Virtue mingles in the bitter tide
Of Paſſion, ſwelling with diſtreſs and pain,
To mitigate the ſharp, with gracious drops
Of cordial Pleaſure. Aſk the faithful youth,
Why the cold urn of her, whom long he loved,
So often fills his arm? So often draws
His lonely footſteps, at the ſilent hour,
To pay the mournful tribute of his tears?
O! he will tell thee, that the wealth of worlds
Should ne'er ſeduce his boſom to forego
That ſacred hour, when ſtealing from the noiſe
Of care and envy, ſweet remembrance ſooths,
With Virtue's kindeſt looks, his aching breaſt,
And turns his tears to rapture. Aſk the croud,
Which flies impatient from the village-walk
To climb the neighbouring cliffs, when far below
The cruel winds have hurled upon the coaſt
Some helpleſs bark: whilſt ſacred Pity melts
The general eye, or Terror's icy hand
Smites their diſtorted limbs, or horrent hair,
While every mother cloſer to her breaſt
Catches her child; and, pointing where the waves
Foam through the ſhattered veſſel, ſhrieks aloud,
As one poor wretch, that ſpreads his piteous arms
For ſuccour, ſwallowed by the roaring ſurge,
As now another, daſhed againſt the rock,
Drops lifeleſs down. O deemeſt thou indeed
No kind endearment here, by nature given,
To mutual terror, and compaſſion's tears?
No ſweetly melting ſoftneſs, which attracts
O'er all that edge of pain, the ſocial powers,
To this their proper action, and their end?"

The poet purſues the ſentiment in the ſame animated imagery, deſcribing the ſtrong, but pleaſurable, ſenſations which the ſoul feels, in reading the ſufferings of heroes who nobly died in the cauſe of liberty and their country:

—————" When the pious band
Of youths, who fought for freedom, and their ſires,
Lie ſide by ſide in gore."

Or, in the ſtrong movements of indignation and revenge againſt the tyrant, who invades that liberty, and enſlaves their country.

——— ———" When the patriot's tear
Starts from thine eye, and thy extended arm
In fancy hurls the thunderbolt of Jove,
To fire the impious wreath on Philip's brow,
Or daſh Octavius from his trophied car;
Say—Does thy ſecret ſoul repine to taſte
The big diſtreſs? Or, would'ſt thou then exchange
Thoſe heart-ennobling ſorrows for the lot
Of him, who ſits amid the gaudy herd
Of mute barbarians, bending to his nod,
And bears aloft his gold-inveſted front,
And ſays within himſelf, " I am a king,
And wherefore ſhould the clamorous voice of wo
Intrude upon mine ear?"

The ſentiment of this charming and moral poet is, that ſympathetic feelings are virtuous, and therefore pleaſant. And from the whole, he deduces this important concluſion; that every virtuous emotion muſt be agreeable, and that this is the ſanction and the reward of virtue. The thought is amiable; the concluſion noble: but ſtill the ſolution appears to us to be imperfect.

We have already ſaid, that the pleaſure ariſing from the contemplation of diſtreſsful ſcenes is a compounded feeling, ariſing from ſeveral diſtinct ſources in the human breaſt. The kind and degree of the ſenſation muſt depend upon the various blendings of the ſeveral ingredients which enter into the compoſition. The cauſe aſſigned by Mr Addiſon, the ſenſe of our own ſecurity, may be ſuppoſed to have ſome ſhare in the maſs of feelings. That of Dr Akenſide may be allowed to have a ſtill larger proportion. Let us attempt to trace ſome of the reſt.

There are few principles in human nature of more general and important influence than that of ſympathy. A late ingenious writer, led by the faſhionable idea of ſimplifying all the ſprings of human nature into one ſource, has, in his beautiful Theory of Moral Sentiments, endeavoured to analyſe a very large number of the feelings of the heart into ſympathetic vibration. Though it appears to us moſt probable, that the human mind, like the human body, poſſeſſes various and diſtinct ſprings of action and of happineſs, yet he has ſhown, in an amazing diverſity of inſtances, the operation and importance of this principle of human nature. Let us apply it to our preſent ſubject.

We naturally ſympathize with the paſſions of others. But if the paſſions they appear to feel be not thoſe of mere diſtreſs alone; if, midſt the ſcenes of calamity, they diſplay fortitude, generoſity, and forgiveneſs; if, "riſing ſuperior to the cloud of ills which covers them," they nobly ſtand firm, collected, and patient; here a ſtill higher ſource of pleaſure opens upon us, from complacence, admiration, and that unutterable ſympathy which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourſelves in their ſituation; we feel, as it were, ſome ſhare of that conſcious integrity and peace which they muſt enjoy. Hence, as before obſerved, the pleaſure will vary, both as to its nature and degree, according to the ſcene and characters before us. The ſhock of contending armies in the field,—the ocean wrought to tempeſt, and covered with the wreck of ſhattered veſſels,—and a worthy family ſilently, yet nobly, bearing up againſt a multitude of ſurrounding ſorrows, will excite very different emotions, becauſe the component parts of the pleaſurable ſenſation conſiſt of very different materials. They all excite admiration; but admiration, how diverſified, both as to its degree and its cauſe! Theſe ſeveral ingredients may doubtleſs be ſo blended together, that the pleaſure ſhall make but a very ſmall part of the mixed ſenſation. The more agreeable tints may bear little proportion to the terrifying red or the gloomy black.

In many of the inſtances which have been mentioned, the pleaſure muſt ariſe chiefly, if not ſolely, from the circumſtances or accompanyments of the ſcene. The ſublime feelings excited by the view of an agitated ocean, relieve and ſoften thoſe occaſioned by the ſhipwreck. And the awe excited by the preſence of thouſands of men, acting as with one ſoul, and diſplaying magnanimity and firmneſs in the moſt ſolemn trial, tempers thoſe ſenſations of horror and of pain which would ariſe from the field of battle.

The gratification we are attempting to account for, depends alſo, in a very conſiderable degree, upon a principle of human nature, implanted in it for the wiſeſt ends; the exerciſe which it gives to the mind, by rouſing it to energy and feeling. Nothing is ſo inſupportable, as that langour and ennui, for the full expreſſion of which our language does not afford a term. How agreeable it is, to have the ſoul called forth to exertion and ſenſibility, let the gameſter witneſs, who, unable to endure the laſſitude and ſameneſs of unanimated luxury, runs with eagerneſs to the place where probably await him all the irritation and agony of tumultuous paſſions.

Again; it is a law of our nature, that oppoſite paſſions, when felt in ſucceſſion, and, above all, when felt at the ſame moment, heighten and increaſe each other. Eaſe ſucceeding pain, certainty after ſuſpenſe, friendſhip after averſion, are unſpeakably ſtronger than if they had not been thus contraſted. In this conflict of feelings, the mind riſes from paſſive to active energy. It is rouſed to intenſe ſenſation; and it enjoys that peculiar, exquiſite, and complex feeling, in which, as in many articles of our table, the acid and the ſweet, the pleaſurable and painful, pungencies are ſo happily mixed together, as to render the united ſenſation amazingly more ſtrong and delightful.

We have not yet mentioned the principle of curioſity, that buſy and active power, which appears ſo early, continues almoſt unimpaired ſo long, and to which, for the wiſeſt ends, is annexed ſo great a ſenſe of enjoyment. To this principle, rather than to a love of cruelty, would we aſcribe that pleaſure which children ſometimes ſeem to feel from torturing flies and leſſer animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unſpeakable conſequence, that this practice be checked as ſoon and as effectually as poſſible, becauſe it is ſo important, that they learn to connect the ideas of pleaſure and pain with the motions and actions of the animal creation. And to this principle may we alſo refer no ſmall ſhare of that pleaſure in the contemplation of diſtreſsful ſcenes, the ſprings of which, in the human heart, we are now endeavouring to open.

To curioſity, then—to ſympathy—to mental exertion—to the idea of our own ſecurity—and to the ſtrong feelings occaſioned by viewing the actions and paſſions of mankind in intereſting ſituations, do we aſcribe that gratification which the mind feels from the ſurvey of many ſcenes of ſorrow. We have called it a *pleaſure*; but it will approach towards, or recede from, pleaſure, according to the nature and proportion of the ingredients of which the ſenſation is compoſed. In ſome caſes, pain will predominate. In others, there will be exquiſite enjoyment.

The final cauſe of this conſtitution of the human mind is probably, that by means of this ſtrong ſenſation, the ſoul may be preſerved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn to practiſe the virtues it admires—and to aſſiſt thoſe to whom its ſympathy can reach—and that it may thus be led, by theſe ſocial exerciſes of the heart, to ſoften with compaſſion—to expand with benevolence—and generouſly to aſſiſt in every caſe, in which aſſiſtance can be given. An end this ſufficient,

—— "To aſſert eternal Providence,
And juſtify the ways of God to man."

DISTRESS, in law, the ſeizing or diſtraining any thing for rent in arrear, or other duty unperformed.

The effect of this diſtreſs is to compel the party either to replevy the things diſtrained, and conteſt the taking, in an action of treſpaſs againſt the diſtrainer; or rather to oblige him to compound and pay the debt or duty for which he was ſo diſtrained.

There are likewiſe compulſory diſtreſſes in actions, to cauſe a perſon appear in court; of which kind there is a diſtreſs perſonal of one's moveable goods, and the profits of his lands, for contempt in not appearing after ſummons: there is likewiſe diſtreſs real, of a perſon's immoveable goods. In theſe caſes none ſhall be diſtrained to anſwer for any thing touching their freeholds, but by the king's writ.

Diſtreſs may be either finite or infinite. Finite diſtreſs is that which is limited by law, in regard to the number of times it ſhall be made, in order to bring the party to a trial of the action. Infinite diſtreſs is that which is without any limitation, being made till the perſon appears: it is farther applied to jurors that do not appear; as, upon a certificate of aſſiſe, the proceſs is *venire facias*, *habeas corpora*, and diſtreſs infinite.

It is alſo divided into grand diſtreſs and ordinary diſtreſs; of theſe the former extends to all the goods and chattels that the party has within the county. A perſon, of common right, may diſtrain for rents and all manner of ſervices; and where a rent is reſerved on a gift in tail, leaſe for life, or years, &c. though there be no clauſe of diſtreſs in the grant or leaſe, ſo as that he has the reverſion: but on a feoffment made in fee, a diſtreſs may not be taken, unleſs it be expreſsly reſerved in the deed.

DISTRIBUTION, in a general ſenſe, the act of dividing a thing into ſeveral parts, in order to the diſpoſing each in its proper place.

Distribution, in architecture, the dividing and diſpoſing the ſeveral parts and pieces which compoſe a building, as the plan directs. See Architecture.

Distribution, in rhetoric, a kind of deſcription, whereby an orderly diviſion and enumeration is made of the principal qualities of the ſubject. David ſupplies us with an example of this kind, when, in the heat of his indignation againſt ſinners, he gives a deſcription of their iniquity: "Their throat is an open ſepulchre; they flatter with their tongues; the poiſon of aſps is under their lips; their mouth is full of curſing and lies; and their feet are ſwift to ſhed blood."

Distribution, in printing, the taking a form aſunder, ſeparating the letters, and diſpoſing them in the caſes again, each in its proper cell. See Printing.

DISTRICT, in geography, a part of a province, diſtinguiſhed by peculiar magiſtrates, or certain privileges; in which ſenſe it is ſynonymous with hundred. See Hundred.

DISTRINGAS, in law, a writ commanding the ſheriff, or other officer, that he diſtrain a perſon for debt to the king, &c. or for his appearance at a certain day.

Distringas Juratores, a writ directed to the ſheriff, whereby he is commanded to diſtrain upon a jury to appear, and to return iſſues on their lands, &c. for non-appearance. This writ of diſtringas juratores iſſues for the ſheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence or incloſure in marſhes, or other wet land where there are no hedges. They allow theſe ditches ſix feet wide againſt highways that are broad; and againſt commons, five feet. But the common ditches about incloſures, dug at the bottom of the bank on which the quick is raiſed, are three feet wide at the top, one at the bottom, and two feet deep. By this means each ſide has a ſlope, which is of great advantage; for where this is neglected, and the ditches dug perpendicular, the ſides are always waſhing down, beſides, in a narrow bottomed ditch, if cattle get down into it, they cannot ſtand to turn themſelves to crop the quick: but where the ditch is four feet wide, it ſhould be two and a half deep; and where it is five wide, it ſhould be three deep; and ſo in proportion.

Ditch-Water is often uſed as an object for the microſcope, and ſeldom fails to afford a great variety of animalcules. This water very often appears of a yellowiſh, greeniſh, or reddiſh colour; and this is wholly owing to the multitudes of animals of thoſe colours which inhabit it. Theſe animals are uſually of the ſhrimp kind: and Swammerdam, who very accurately examined them, has called them, from the figure of their horns, *pulex aquaticus arboreſcens*. They copulate in May or June; and are often ſo numerous at that ſeaſon, that the whole body of the water they are found in, is ſeen to be of a red, green, or yellowiſh colour, according to the colours of their bodies. The green thin ſcum alſo, ſo frequently ſeen on the ſurface of ſtanding waters in ſummer, is no other than a multitude of ſmall animalcules of this or ſome of the other kinds. Dunghill water is not leſs full of animals than that of ditches; and is often found ſo thronged with animalcules, that it ſeems altogether alive: it is then ſo very much crowded with theſe creatures, that it muſt be diluted with clear water before they can be diſtinctly viewed. There are uſually in this fluid a ſort of eels, which are extremely active; and beſides theſe and many other of the common inhabitants of fluids, there is one ſpecies found in this which ſeems peculiar to it: the middle part of them is dark and beſet with hairs, but the ends are tranſparent; their tails are tapering, with a long ſprig at the extremity, and their motion is ſlow and waddling. See Animalcule.

Ditch, in fortification, called alſo *foſs* and *moat*, a trench dug round the rampart or wall of a fortified place, between the ſcarp and counterſcarp. See Fortification.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of tranſport and poetical rage.

This poetry owes its birth to Greece, and to the tranſports of wine; and yet art is not quite exploded, but delicately applied to guide and reſtrain the dithyrambic impetuoſity, which is indulged only in pleaſing flights. Horace and Ariſtotle tell us, that the ancients gave the name of dithyrambus to thoſe verſes wherein none of the common rules or meaſures were obſerved. As we have now no remains of the dithyrambus of the ancients, we cannot ſay exactly what their meaſure was.

DITONE, in muſic, an interval comprehending two tones. The proportion of the ſounds that form the ditone is 4 : 5, and that of the ſemiditone is 5 : 6.

DITRIHEDRIA, in mineralogy, a genus of ſpars with twice three ſides, or ſix planes; being formed of two trigonal pyramids joined baſe to baſe, without any intermediate column. See Spar.

The ſpecies of ditrihedria are diſtinguiſhed by the different figures of theſe pyramids.

DITTANDER, in botany. See Lepidium.

DITTANY, in botany. See Dictamnus.

DITTO, in books of accounts, uſually written D°, ſignifies the aforementioned. The word is corrupted from the Italian *detto*, "the ſaid:" as in our law-phraſe, "the ſaid premiſſes," meaning the ſame as were aforementioned.

DIVAL, in heraldry, the herb nightſhade, uſed by ſuch as blazon by flowers and herbs, inſtead of colours and metals, for ſable or black.

DIVALIA, in antiquity, a feaſt held among the ancient Romans, on the 21ſt day of December, in honour of the goddeſs Angerona; whence it is alſo called *Angeronalia*.—On the day of this feaſt, the pontifices performed ſacrifice in the temple of Voluptia, or the goddeſs of joy and pleaſure; who, ſome ſay, was the ſame with Angerona, and ſuppoſed to drive away all the ſorrows and chagrins of life.

DIVAN, a council-chamber or court of juſtice among the eaſtern nations, particularly the Turks.—The word is Arabic, and ſignifies the ſame with SOFA in the Turkiſh dialect.

There are two ſorts of divans; that of the grand ſignior, called *the council of ſtate*, which conſiſts of ſeven of the principal officers of the empire; and that of the grand vizir, compoſed of ſix other vizirs or counſellors of ſtate, the chancellor, and ſecretaries of ſtate, for the diſtribution of juſtice.

The word is alſo uſed for a hall in the private houſes of the orientals. The cuſtom of China does not allow the receiving of viſits in the inner parts of the houſe, but only at the entry, in a divan contrived on purpoſe for ceremonies.

Travellers relate wonders of the ſilence and expedition of the divans of the Eaſt.

DIVAN-Beghi, the ſuperintendant of juſtice in Perſia, whoſe place is the laſt of the ſix miniſters of the ſecond rank, who are all under the athemadauler or firſt miniſter. To this tribunal of the divan-beghi he appeals from ſentences paſſed by the governors. He has a fixed ſtipend of 50,000 crowns for adminiſtering juſtice. All the ſerjeants, uſhers, &c. of the court are in his ſervice. He takes cogniſance of the criminal cauſes of the chams, governors, and other great lords of Perſia, when accuſed of any fault. There are divan-beghis not only at court and in the capital, but alſo in the provinces and other cities of the empire. The alcoran is the ſole rule of his adminiſtration of juſtice, which alſo he interprets at pleaſure. He takes no cogniſance of civil cauſes; but all differences ariſing between the officers of the king's houſehold and between foreign miniſters are determined by him.

DIVANDUROW, the name of ſeven iſlands which lie a league north of the Maldives, and 24 from the coaſt of Malabar, almoſt oppoſite to Cananor.

DIVER, in ornithology. See COLYMBUS.

DIVERGENT, or DIVERGING, LINES, in geometry, are thoſe which conſtantly recede from each other.

DIVERGENT Rays, in optics, are thoſe which, going from a point of the viſible object, are diſperſed, and continually depart one from another, in proportion as they are removed from the object: in which ſenſe it is oppoſed to convergent. See OPTICS.

DIVERSIFYING, in rhetoric, is of infinite ſervice to the orator; it is an accompliſhment eſſential to his character, and may fitly be called the ſubject of all his tropes and figures. Voſſius lays down ſix ways of diverſifying a ſubject. 1. By enlarging on what was briefly mentioned before. 2. By a conciſe enumeration of what had been inſiſted on at length. 3. By adding ſomething new to what is repeated. 4. By repeating only the principal heads of what had been ſaid. 5. By tranſpoſing the words and periods. 6. By imitating them.

DIVERSION, in military affairs, is when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diverſion in attacking Carthage.

DIVESTING, properly ſignifies undreſſing, or ſtripping off one's garment; in contradiſtinction from inveſting.

In law, it is uſed for the act of ſurrendering or relinquiſhing one's effects. By a contract of donation or ſale, the donor or ſeller is ſaid to be diſſeiſed and diveſted of their property in ſuch a commodity, and the donee or purchaſer becomes inveſted therewith. See INVESTITURE.

A demiſe is a general diveſtiture which the fathers and mothers make of all their effects in favour of their children.

DIVIDEND, in arithmetic, the number propoſed to be divided into equal parts. See ARITHMETIC, n° 14.

DIVIDEND of Stocks, is a ſhare or proportion of the intereſt of ſtocks erected on public funds, as the ſouth-ſea, &c. divided among and paid to the adventurers half-yearly.

DIVINATION, the knowledge of things obſcure or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converſe familiarly with ſome men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and deſigns. Plato, Ariſtotle, Plutarch, Cicero, and others, divide divination into two ſorts or ſpecies, *viz.* natural and artificial.

The former was ſo called, becauſe not attained by any rules or precepts of art, but infuſed or inſpired into the diviner, without his taking any further care about it than to purify and prepare himſelf for the reception of the divine afflatus. Of this kind were all thoſe who delivered oracles, and foretold future events by inſpiration, without obſerving external ſigns or accidents.

The ſecond ſpecies of divination was called *artificial*, becauſe it was not obtained by immediate inſpiration, but proceeded upon certain experiments and obſervations arbitrarily inſtituted, and moſtly ſuperſtitious. Of this ſort there were various kinds, as by ſacrifices, entrails, flame, cakes, flour, wine, water, birds, lots, verſes, omens, &c.

In holy ſcripture we find mention made of nine different kinds of divination. The firſt performed by the inſpection of planets, ſtars, and clouds: it is ſuppoſed to be the practiſers of this whom Moſes calls מעונן *meonen*, of ענן *anan*, "cloud," Deuter. ch. xviii. v. 10. 2. Thoſe whom the prophet calls in the ſame place מנחש *menacheſch*, which the vulgate and generality of interpreters render *augur*. 3. Thoſe who in the ſame place are called מכשף *mecaſcheph*, which the ſeptuagint and vulgate tranſlate "a man given to ill practices." 4. Such authors whom Moſes in the ſame chapter, ver. 11. calls חובר *hhober*. 5. Thoſe who conſult the ſpirits called *Python*; or, as Moſes expreſſes it in the ſame book, אוב אשל "thoſe who aſk queſtions of Python." 6. Witches or magicians, whom Moſes calls ידעני *judeoni*. 7. Thoſe who conſult the dead, *necromancers*. 8. The prophet Hoſea, chap. iv. ver. 12. mentions ſuch as conſult ſtaves, שאל מקלי; which kind of divination may be called *rhabdomancy*. 9. The laſt kind of divination mentioned in ſcripture is *hepatoſcopy*, or the conſideration of the liver.

Divination of all kinds was neceſſarily made an occult ſcience, which naturally remained in the hands of the prieſts and prieſteſſes, the magi, the ſoothſayers, the augurs, the viſionaries, the prieſts of the oracles, the falſe prophets, and other like profeſſors, till the time of the coming of Jeſus Chriſt. The light of the goſpel, it is true, has diſſipated much of this darkneſs; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted ſuperſtition, even though the truth be ſet in the ſtrongeſt light, eſpecially when the error has been believed almoſt from the origin of the world: ſo we ſtill find exiſting among us the remains of this pagan ſuperſtition, in the following chimeras, which enthuſiaſtic and deſigning men have formed into arts and ſciences; though it muſt be owned, to the honour of the 18th century, that the pure doctrines of Chriſtianity, and the ſpirit of philoſophy, which become every day more diffuſed, equally concur in baniſhing theſe viſionary opinions. The vogue for theſe pretended ſciences and arts, moreover, is paſt, and they can no longer be named without exciting ridicule in all ſenſible people. By relating them here, therefore, and drawing them from their obſcurity, we only mean to ſhow their futility, and to mark thoſe rocks againſt which the human mind, without the aſſiſtance of a pilot, might eaſily run.

For the attaining of theſe ſupernatural qualifications, there are ſtill exiſting in the world the remains of,

1. *Aſtrology*: a conjectural ſcience which teaches to judge of the effects and influences of the ſtars; and to predict future events by the ſituation of the planets and their different aſpects. It is divided into *natural aſtrology*, or *meteorology*; which is confined to the foretelling of natural effects, as the winds, rain, hail, and ſnow, froſts and tempeſts. In this conſiſts one branch of the art of almanack-makers; and by merely confronting theſe predictions in the kalendar, with the weather each day produces, every man of ſenſe will ſee what regard is to be paid to this part of aſtrology. The other part, which is called *judicial aſtrology*, is ſtill far more illuſive and raſh than the former: and having been at firſt the wonderful art of viſionaries, it afterwards became that of impoſtors; a very common fate with all thoſe chimerical ſciences, of which we ſhall here ſpeak. This art pretends to teach the method of predicting all ſorts of events that ſhall happen upon the earth, as well ſuch as relate to the public as to private perſons; and that by the ſame inſpection of the ſtars and planets and their different conſtellations. The *cabala* ſignifies, in like manner, the knowledge of things that are above the moon, as the celeſtial bodies and their influences; and in this ſenſe it is the ſame with judicial aſtrology, or makes a part of it.

2. *Horoſcopy*, which may alſo be conſidered as a part of aſtrology, is the art by which they draw a figure, or celeſtial ſcheme, containing the 12 houſes, wherein they mark the diſpoſition of the heavens at a certain moment; for example, that at which a man is born, in order to foretel his fortune, or the incidents of his life. In a word, it is the diſpoſition of the ſtars and planets at the moment of any perſon's birth. But as there cannot be any probable or poſſible relation between the conſtellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, falſe, abſurd, and a criminal impoſition on mankind.

3. The art of *augury* conſiſted, among the ancient Romans, in obſerving the flight, the ſinging and eating of birds, eſpecially ſuch as were held ſacred. See AUGURY.

4. The equally deceitful art of *haruſpicy* conſiſted, on the contrary, in the inſpection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterpriſes.

5. *Aeromancy* was the art of divining by the air. This vain ſcience has alſo come to us from the Pagans: but is rejected by reaſon as well as Chriſtianity, as falſe and abſurd.

6. *Pyromancy* is a divination made by the inſpection of a flame, either by obſerving to which ſide it turns, or by throwing into it ſome combuſtible matter, or a bladder filled with wine, or any thing elſe from which they imagined they were able to predict.

7. *Hydromancy* is the ſuppoſed art of divining by water. The Perſians, according to Varro, invented it; Pythagoras and Numa Pompilius made uſe of it; and we ſtill admire the like wonderful prognoſticators.

8. *Geomancy* was a divination made by obſerving of cracks or clefts in the earth. It was alſo performed by points made on paper, or any other ſubſtance, at a venture; and they judged of future events from the figures that reſulted from thence. This was certainly very ridiculous; but it is nothing leſs ſo to pretend to predict future events by the inſpection of the grounds of a diſh of tea or coffee, or by cards, and many other like matters.—Thus have deſigning men made uſe of the four elements to deceive their credulous brethren.

9. *Chiromancy* is the art which teaches to know, by inſpecting the hand, not only the inclinations of a man, but his future deſtiny alſo. The fools or impoſtors who practiſe this art pretend, that the different parts or the lines of the hand have a relation to the internal parts of the body, as ſome to the heart, others to the liver, ſpleen, &c. On this falſe ſuppoſition, and on many others equally extravagant, the principles of chiromancy are founded: and on which, however, ſeveral authors, as Robert Flud an Engliſhman, Artemidorus, M. de la Chambre, John of Indagina, and many others, have written large treatiſes.

10. *Phyſiognomy*, or *phyſiognomancy*, is a ſcience that pretends to teach the nature, the temperament, the underſtanding, and the inclinations of men, by the in-

ſpection of their countenances, and is therefore very little leſs frivolous than chiromancy; though Ariſtotle, and a number of learned men after him, have written expreſs treatiſes concerning it.

DIVINE, ſomething relating to God. The word is alſo uſed, figuratively, for any thing that is excellent, extraordinary, and that ſeems to go beyond the power of nature and the capacity of mankind. In which ſenſe, the compaſs, teleſcope, clocks, &c. are ſaid to be *divine inventions:* Plato is called the *divine author*, the *divine Plato;* and the ſame appellation is given to Seneca: Hippocrates is called, “the divine old man,” *divinus ſenex*, &c.

DIVING, the art or act of deſcending under water to conſiderable depths, and abiding there a competent time.

The uſes of diving are very conſiderable, particularly in the fiſhing for pearls, corals, ſpunges, &c. See *Pearl-Fiſhing*, &c.

There have been various methods propoſed, and machines contrived, to render the buſineſs of diving more ſafe and eaſy. The great point is to furniſh the diver with freſh air; without which, he muſt either make a ſhort ſtay or periſh.

Thoſe who dive for ſpunges in the Mediterranean, help themſelves by carrying down ſpunges dipt in oil in their mouths. But conſidering the ſmall quantity of air that can be contained in the pores of a ſpunge, and how much that little will be contracted by the preſſure of the incumbent water, ſuch a ſupply cannot long ſubſiſt the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inſpired and exſpired by the lungs, becomes unfit for reſpiration in little more than one minute of time. For though its elaſticity be but little altered in paſſing the lungs, yet it loſes its vivifying ſpirit, and is rendered effete.

In effect, a naked diver, Dr Halley aſſures us, without a ſpunge, cannot remain above a couple of minutes incloſed in water, nor much longer with one, without ſuffocating; nor, without long practice, near ſo long; ordinary perſons beginning to ſtifle in about half a minute. Beſides, if the depth be conſiderable, the preſſure of the water in the veſſels makes the eyes blood-ſhotten, and frequently occaſions a ſpitting of blood.

Hence, where there has been occaſion to continue long at the bottom, ſome have contrived double flexible pipes, to circulate air down into a cavity, incloſing the diver as with armour, both to furniſh air and to bear off the preſſure of the water, and give leave to his breaſt to dilate upon inſpiration; the freſh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth ſurpaſſes three fathoms; the water embracing the bare limbs ſo cloſely as to obſtruct the circulation of the blood in them; and withal preſſing ſo ſtrongly on all the junctures where the armour is made tight with leather, that, if there be the leaſt defect in any of them, the water ruſhes in, and inſtantly fills the whole engine, to the great danger of the diver's life.

It is certain, however, that people, by being accuſtomed to the water from their infancy, will at length be enabled, not only to ſtay much longer under water than the time above mentioned, but put on a kind of amphibious nature, ſo that they ſeem to have the uſe of all their faculties as well when their bodies are immerſed in water as when they are on dry land. Moſt ſavage nations are remarkable for this. According to the accounts of our late voyagers, the inhabitants of the South-ſea iſlands are ſuch expert divers, that when a nail or any piece of iron was thrown overboard, they would inſtantly jump into the ſea after it, and never failed to recover it, notwithſtanding the quick deſcent of the metal. Even among civilized nations, many perſons have been found capable of continuing an incredible length of time below water. The moſt remarkable inſtance of this kind is the famous Sicilian diver Nicolo Peſce. The authenticity of the account, indeed, depends entirely on the authority of F. Kircher. He aſſures us, that he had it from the archives of the kings of Sicily: but, notwithſtanding this aſſertion, the whole hath ſo much of the marvellous in it, that we believe there are few who will not look upon it to have been exaggerated. “In the times of Frederic king of Sicily (ſays Kircher), there lived a celebrated diver, whoſe name was *Nicholas*, and who, from his amazing ſkill in ſwimming, and his perſeverance under water, was ſurnamed the *fiſh*. This man had from his infancy been uſed to the ſea; and earned his ſcanty ſubſiſtence by diving for corals and oyſters, which he ſold to the villagers on ſhore. His long acquaintance with the ſea, at laſt, brought it to be almoſt his natural element. He was frequently known to ſpend five days in the midſt of the waves, without any other proviſions than the fiſh which he caught there and ate raw. He often ſwam over from Sicily into Calabria, a tempeſtuous and dangerous paſſage, carrying letters from the king. He was frequently known to ſwim among the gulphs of the Lipari iſlands, noway apprehenſive of danger.

“Some mariners out at ſea, one day obſerved ſomething at ſome diſtance from them, which they regarded as a ſea-monſter; but upon its approach it was known to be Nicholas, whom they took into their ſhip. When they aſked him whither he was going in ſo ſtormy and rough a ſea, and at ſuch a diſtance from land, he ſhowed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in ſuch a manner as that they could not be wetted by the ſea. He kept them thus company for ſome time in their voyage, converſing, and aſking queſtions; and after eating an hearty meal with them, he took his leave, and, jumping into the ſea, purſued his voyage alone.

“In order to aid theſe powers of enduring in the deep, nature ſeemed to have aſſiſted him in a very extraordinary manner: for the ſpaces between his fingers and toes were webbed, as in a gooſe; and his cheſt became ſo very capacious, that he could take in, at one inſpiration, as much breath as would ſerve him for a whole day.

“The account of ſo extraordinary a perſon did not fail to reach the king himſelf; who commanded Nicholas to be brought before him. It was no eaſy matter to find Nicholas, who generally ſpent his time in the ſolitudes of the deep; but, at laſt, after much ſearching, he was found, and brought before his majeſty. The curioſity of this monarch had been long excited by the accounts he had heard of the bottom of the gulph of Charybdis; he now therefore conceived, that it would be a proper opportunity to have more certain information. He therefore commanded our poor diver to examine the bottom of this dreadful whirlpool; and as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not inſenſible of the danger to which he was expoſed; dangers beſt known only to himſelf; and therefore he preſumed to remonſtrate: but the hopes of the reward, the deſire of pleaſing the king, and the pleaſure of ſhowing his ſkill, at laſt prevailed. He inſtantly jumped into the gulph, and was as inſtantly ſwallowed up in its boſom. He continued for three quarters of an hour below; during which time the king and his attendants remained on ſhore, anxious for his fate; but he at laſt appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be ſuppoſed he was received with applauſe when he came on ſhore: the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was ſomewhat fatigued and debilitated by his labour, after an hearty meal he was put to bed, and permitted to refreſh himſelf by ſleeping.

"When his ſpirits were thus reſtored, he was again brought to ſatisfy the king's curioſity with a narrative of the wonders he had ſeen; and his account was to the following effect. He would never, he ſaid, have obeyed the king's commands, had he been appriſed of half the dangers that were before him. There were four things, he ſaid, which rendered the gulph dreadful, not only to men, but to fiſhes themſelves. 1. The force of the water burſting up from the bottom, which required great ſtrength to reſiſt. 2. The abruptneſs of the rocks that on every ſide threatened deſtruction. 3. The force of the whirlpool daſhing againſt thoſe rocks. And, 4. The number and magnitude of the polypous fiſh, ſome of which appeared as large as a man; and which, every where ſticking againſt the rocks, projected their fibrous arms to entangle him. Being aſked how he was able ſo readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock againſt which he himſelf was urged in his deſcent. This account, however, did not ſatisfy the king's curioſity. Being requeſted to venture once more into the gulph for further diſcoveries, he at firſt refuſed: but the king, deſirous of having the moſt exact information poſſible of all things to be found in the gulph, repeated his ſolicitations; and, to give them ſtill greater weight, produced a larger cup than the former, and added alſo a purſe of gold. Upon theſe conſiderations the unfortunate diver once again plunged into the whirlpool, and was never heard of more."

To obviate the inconveniences of diving to thoſe who have not the extraordinary powers of the diver above mentioned, different inſtruments have been contrived. The chief of theſe is the diving bell; which is moſt conveniently made in form of a truncated cone, the ſmaller baſe being cloſed, and the larger open. It is to be poiſed with lead; and ſo ſuſpended, that the veſſel may ſink full of air, with its open baſis downward, and as near as may be in a ſituation parallel to the horizon, ſo as to cloſe with the ſurface of the water all at once.

Under this covercle the diver ſitting, ſinks down with the included air to the depth deſired: and if the cavity of the veſſel can contain a tun of water, a ſingle man may remain a full hour, without much inconvenience, at five or ſix fathoms deep. But the lower you go, ſtill the included air contracts itſelf according to the weight of the water which compreſſes it: ſo that at 33 feet deep the bell becomes half full of water, the preſſure of the incumbent water being then equal to that of the atmoſphere; and at all other depths the ſpace occupied by the compreſſed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the ſurface of the water in the bell below the common ſurface thereof. And this condenſed air being taken in with the breath ſoon inſinuates itſelf into all the cavities of the body, and has no ill effect, provided the bell be permitted to deſcend ſo ſlowly as to allow time for that purpoſe. One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores ſo ſmall as not to give admiſſion even to the air itſelf, unleſs they be dilated and diſtended by a conſiderable force. Hence, on the firſt deſcent of the bell, a preſſure begins to be felt on each ear; which, by degrees, grows painful, till the force overcoming the obſtacle, what conſtringes theſe pores yields to the preſſure, and letting ſome condenſed air ſlip in, preſently eaſe enſues. The bell deſcending lower, the pain is renewed, and again eaſed in the ſame manner.

But the greateſt inconvenience of this engine is, that the water entering it, contracts the bulk of air into ſo ſmall a compaſs, that it ſoon heats and becomes unfit for reſpiration: ſo that there is a neceſſity for its being drawn up to recruit it; beſides the uncomfortable abiding of the diver almoſt covered with water.

To obviate the difficulties of the diving-bell, Dr Halley, to whom we owe the preceding account, contrived ſome further apparatus, whereby not only to recruit and refreſh the air from time to time, but alſo to keep the water wholly out of it at any depth. The manner in which this was effected, he relates in the following words.

"The bell I made uſe of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncate cone, whoſe diameter at the top was three feet, and at the bottom five. This I coated with lead ſo heavy that it would ſink empty; and I diſtributed the weight ſo about its bottom, that it would go down in a perpendicular direction, and no other. In the top I fixed a ſtrong but clear glaſs, as a window, to let in the light from above; and likewiſe a cock to let out the hot air that had been breathed: and below, about a yard under the bell, I placed a ſtage which hung by three ropes, each of which was charged with about one hundred weight to keep it ſteady. This machine I ſuſpended from the maſt of a ſhip by a ſprit, which was ſufficiently ſecured by ſtays to the maſthead, and was directed by braces to carry it overboard clear of the ſhip's ſide, and to bring it again within board as occaſion required.

Plate CLXIII.

Fig. 1. Halley's
DIVING BELL.

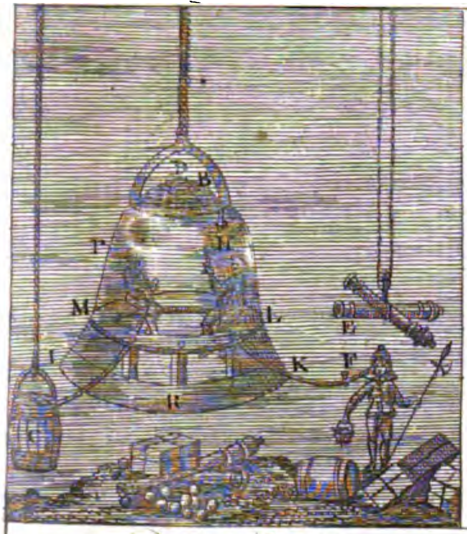


Fig. 2.
Triewald's.

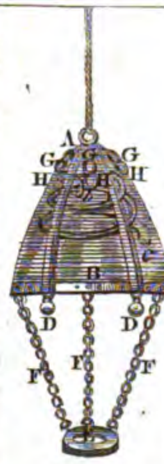
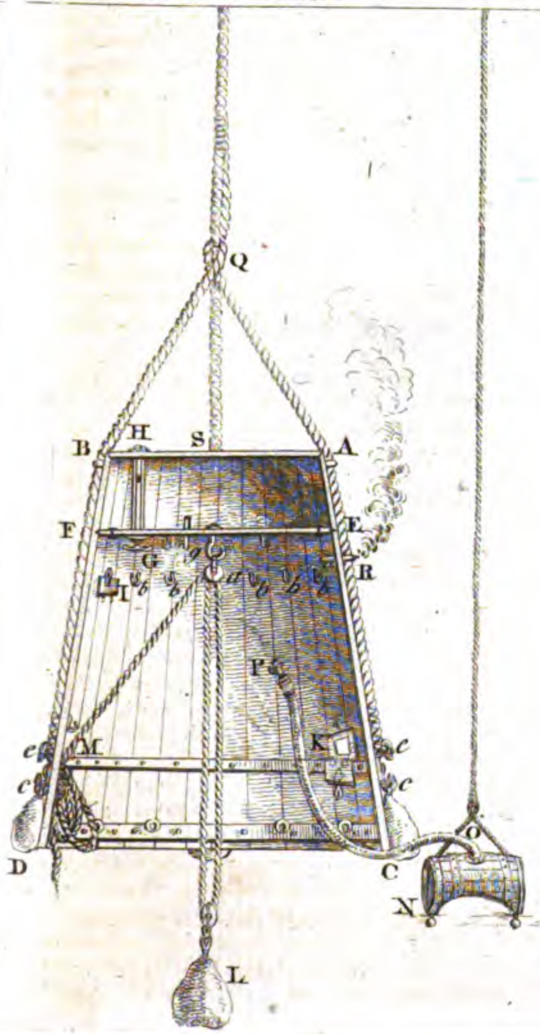


Fig. 3. Spalding's
DIVING BELL.



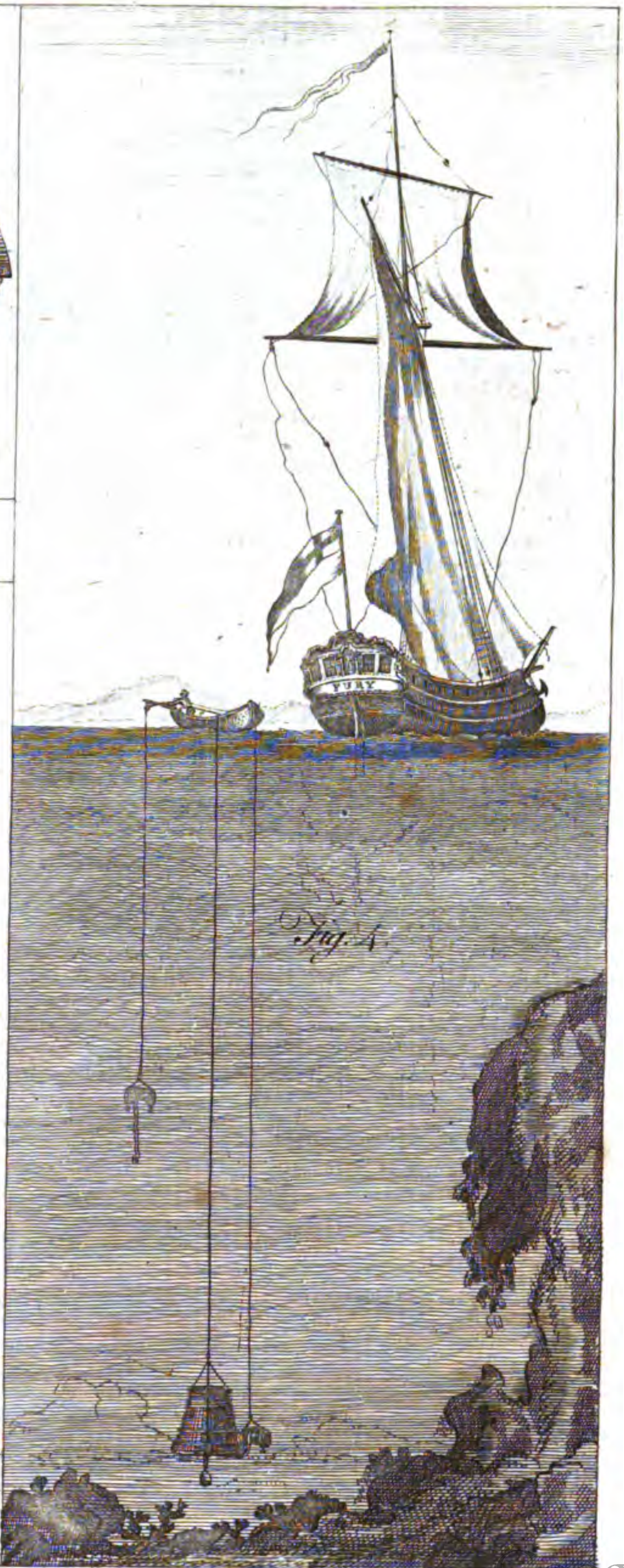


Fig. 4.

A. Bell Sculpt.

“ To ſupply air to this bell when under water, I cauſed a couple of barrels of about 36 gallons each to be caſed with lead, ſo as to ſink empty; each of them having a bung-hole in its loweſt parts to let in the water, as the air in them condenſed on their deſcent; and to let it out again when they were drawn up full from below. And to a hole in the uppermoſt part of theſe barrels, I fixed a leathern trunk or hoſe well liquored with bees wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended: ſo that the air in the upper part of the barrels could not eſcape, unleſs the lower ends of theſe hoſe were firſt lifted up.

“ The air-barrels being thus prepared, I fitted them with tackle proper to make them riſe and fall alternately, after the manner of two buckets in a well; which was done with ſo much eaſe, that two men, with leſs than half their ſtrength, could perform all the labour required: and in their deſcent they were directed by lines faſtened to the under edge of the bell, the which paſſed through rings on both ſides the leathern hoſe in each barrel; ſo that, ſliding down by theſe lines, they came readily to the hand of a man who ſtood on the ſtage on purpoſe to receive them, and to take up the ends of the hoſe into the bell. Through theſe hoſe, as ſoon as their ends came above the ſurface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell; whilſt the water entered at the bung-holes below, and filled them: and as ſoon as the air of one barrel had been thus received, upon a ſignal given, that was drawn up, and at the ſame time the other deſcended; and, by an alternate ſucceſſion, furniſhed air ſo quick, and in ſo great plenty, that I myſelf have been one of five who have been together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any ſort of ill conſequence: and I might have continued there as long as I pleaſed, for any thing that appeared to the contrary. Beſides, the whole cavity of the bell was kept entirely free from water, ſo that I ſat on a bench which was diametrically placed near the bottom, wholly dreſſed, with all my cloaths on. I only obſerved, that it was neceſſary to be let down gradually at firſt, as about 12 feet at a time; and then to ſtop and drive out the air that entered, by receiving three or four barrels of freſh air before I deſcended further. But being arrived at the depth deſigned, I then let out as much of the hot air that had been breathed, as each barrel would repleniſh with cool, by means of the cock at the top of the bell; through whoſe aperture, though very ſmall, the air would ruſh with ſo much violence, as to make the ſurface of the ſea boil, and to cover it with a white foam, notwithſtanding the weight of the water over us.

“ Thus I found that I could do any thing that required to be done juſt under us; and that, by taking off the ſtage, I could, for a ſpace as wide as the circuit of the bell, lay the bottom of the ſea ſo far dry, as not to be overſhoes thereon. And, by the glaſs window, ſo much light was tranſmitted, that when the ſea was clear, and eſpecially when the ſun ſhone, I could ſee perfectly well to write or read; much more to faſten or lay hold on any thing under us that was to be taken up. And, by the return of the air-barrels, I often ſent up orders written with an iron pen, on ſmall plates of lead, directing how to move us from place to place as occaſion required. At other times, when the water was troubled and thick, it would be as dark as night below; but in ſuch caſes I have been able to keep a candle burning in the bell as long as I pleaſed, notwithſtanding the great expence of air neceſſary to maintain flame.—By an additional contrivance, I have found it not impracticable for a diver to go out of an engine to a good diſtance from it, the air being conveyed to him with a continued ſtream, by ſmall flexible pipes; which pipes may ſerve as a clue, to direct him back again when he would return to the bell.”

Plate CLXIII. fig. 1. ſhows Dr Halley's diving bell, with the divers at work. DBLKRIMP repreſents the body of the bell. D, the glaſs which ſerves as a window. B, the cock for letting out the air which has been breathed. LM, the ſeats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a diſtance from the bell, and breathing through the flexible tube K.---This diver is ſuppoſed to have a head-piece of lead, made to fit quite cloſe about his ſhoulders: this head-piece was capable of containing as much air as would ſupply him for a minute or two. When he had occaſion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new ſupply at pleaſure.

Since the invention of this diving machine, there has been one contrived by Mr Triewald, F. R. S. and military architect to the king of Sweden, which, for a ſingle perſon, is in ſome reſpects thought to be more eligible than Dr Halley's, and is conſtructed as follows. AB is the bell, which is ſunk by lead weights DD hung to its bottom. This bell is of copper, and tinned all over in the inſide, which is illuminated by three ſtrong convex lenſes, G, G, G, with copper lids H, H, H, to defend them. The iron ring or plate E ſerves the diver to ſtand on when he is at work; and is ſuſpended at ſuch a diſtance from the bottom of the bell by the chains F, F, F, that when the diver ſtands upright, his head is juſt above the water in the bell, where the air is much better than higher up, becauſe it is colder, and conſequently more fit for reſpiration. But as the diver muſt always be within the bell, and his head of courſe in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as well as he can, he may, by means of a ſpiral copper tube *bc*, placed cloſe to the inſide of the bell, draw the cooler and freſher air from the lowermoſt parts: for which purpoſe, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at *b*; and to the other end of this tube is fixed an ivory mouth-piece, by which the diver draws in the air.

Fig. 2.

The greateſt improvement, however, which the diving bell ever received, or probably can receive, was from the late Mr Spalding of Edinburgh. A ſection of his improved diving-bell is repreſented in fig. 3. This conſtruction is deſigned to remedy ſome inconveniences of Dr Halley's, which are very evident, and of very dangerous tendency. Theſe are, 1. By Dr Halley's conſtruction, the ſinking or raiſing of the bell depends entirely

Fig. 3.

tirely on the people who are at the ſurface of the water; and as the bell even when in the water has a very conſiderable weight, the raiſing it not only requires a great deal of labour, but there is a poſſibility of the rope breaking by which it is raiſed, and thus every perſon in the bell would inevitably periſh. 2. As there are, in many places of the ſea, rocks which lie at a conſiderable depth, the figure of which cannot poſſibly be perceived from above, there is danger that ſome of their ragged prominences may catch hold of one of the edges of the bell in its deſcent, and thus overſet it before any ſignal can be given to thoſe above, which would infallibly be attended with the deſtruction of the people in the bell: and as it muſt always be unknown, before trial, what kind of a bottom the ſea has in any place, it is plain, that without ſome contrivance to obviate this laſt danger, the deſcent in Dr Halley's diving-bell is not at all eligible.

How theſe inconveniences are remedied by Mr Spalding's new conſtruction will be eaſily underſtood from the following deſcription.—ABCD repreſents a ſection of the bell, which is made of wood; *e, e*, are iron hooks, by means of which it is ſuſpended by ropes QBF*e*, and QAER*e*, and QS, as expreſſed in the figure: *c, c*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the ſurface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By theſe weights alone, however, the bell would not ſink: another is therefore added, repreſented at L; and which can be raiſed or lowered at pleaſure, by means of a rope paſſing over the pulley *a*, and faſtened to one of the ſides of the bell at M. As the bell deſcends, this weight, called by Mr Spalding the *balance weight*, hangs down a conſiderable way below the mouth of the bell. In caſe the edge of the bell is catched by any obſtacle, the balance-weight is immediately lowered down ſo that it may reſt upon the bottom. By this means the bell is lightened ſo that all danger of overſetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will riſe, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will ſerve as a kind of anchor to keep the bell at any particular depth which the divers may think neceſſary; or by pulling it quite up, the deſcent may be continued to the very bottom.

By another very ingenious contrivance, Mr Spalding rendered it poſſible for the divers to raiſe the bell, with all the weights appended to it, even to the ſurface, or to ſtop at any particular depth, as they think proper; and thus they could ſtill be ſafe, even though the rope deſigned for pulling up the bell was broke. For this purpoſe the bell is divided into two cavities, both of which are made as tight as poſſible. Juſt above the ſecond bottom EF, are ſmall ſlits in the ſides of the bell; through which the water, entering as the bell deſcends, diſplaces the air originally contained in this cavity, which flies out at the upper orifice of the cock GH. When this is done, the divers turn the handle G, which ſtops the cock; ſo that if any more air was to get into the cavity AEFB, it could not longer be diſcharged through the orifice H as before. When this cavity is full of water, the bell ſinks; but when a conſiderable quantity of air is admitted, it riſes. If therefore the divers have a mind to raiſe themſelves, they turn the ſmall cock *g*, by which a communication is made between the upper and under cavities of the bell. The conſequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is diſplaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will deſcend very ſlowly; if a greater quantity, it will neither aſcend nor deſcend, but remain ſtationary; and if a larger quantity of air is ſtill admitted, it will ariſe to the top. It is to be obſerved, however, that the air which is thus let out into the upper cavity muſt be immediately replaced from the air-barrel; and the air is to be let out very ſlowly, or the bell will riſe to the top with ſo great velocity that the divers will be in danger of being ſhaken out of their ſeats. But, by following theſe directions, every poſſible accident may be prevented, and people may deſcend to great depths without the leaſt apprehenſion of danger. The bell alſo becomes ſo eaſily manageable in the water, that it may be conducted from one place to another by a ſmall boat with the greateſt eaſe, and with perfect ſafety to thoſe who are in it.

Inſtead of wooden ſeats uſed by Dr Halley, Mr Spalding made uſe of ropes ſuſpended by hooks *bbb*; and on theſe ropes the divers may ſit without any inconvenience. I and K are two windows made of thick ſtrong glaſs, for admitting light to the divers. N repreſents an air-caſk with its tackle, and OCP the flexible pipe through which the air is admitted to the bell. In the aſcent and deſcent of this caſk the pipe is kept down by a ſmall weight appended, as in Dr Halley's machine. R is a ſmall cock by which the hot air is diſcharged as often as it becomes troubleſome. Fig. 4. is a repreſentation of the whole diving apparatus, which it is hoped will be readily underſtood without any further explanation. Two air-barrels are repreſented in this figure; but Mr Spalding was of opinion, that one capable of containing 30 gallons is ſufficient for an ordinary machine. Fig. 4.

We are told of another method put in practice by a gentleman of Devonſhire. He has contrived a large caſe of ſtrong leather, perfectly water-proof, which may hold about half a hogſhead of air. This is ſo contrived, that, when he ſhuts himſelf up in this caſe, he may walk at the bottom of the ſea, and go into any part of a wrecked veſſel, and deliver out the goods. This method, we are told, he has practiſed for many years, and has thus acquired a large fortune. It would be a conſiderable improvement on this machine to condenſe the air in it as much as poſſible before the diver deſcended; as he would thus be furniſhed with an atmoſphere endued with elaſticity ſufficient to reſiſt the weight of the water, which otherwiſe would ſqueeze his caſe into much leſs room than it originally took up. The condenſed air alſo would ſerve for reſpiration a much longer time than that which is in its ordinary ſtate.

Diving-Bladder, a machine invented by Borelli, and by him preferred, though without any good reaſon, to the diving-bell. It is a globular veſſel of braſs or copper, about two feet in diameter, which contains the diver's head. It is fixed to a goat's-ſkin habit exactly fitted to his perſon. Within the veſſel are pipes; by means of which a circulation of air is contrived; and the perſon carries an air-pump by his ſide, by which he can make himſelf heavier or lighter as fiſhes do, by contracting or dilating their air bladder By this means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being, as he imagined, deprived of its noxious qualities by circulating through the pipes. Theſe advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the preſſure of the water only by a goat's-ſkin, would infallibly be cruſhed if he deſcended to any conſiderable depth; and from the diſcoveries now made by Dr Prieſtley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be reſtored by circulation through pipes. Concerning the uſe of copper machines in general, Mr Spalding favoured us with the following curious obſervation, namely, That when a perſon has breathed in them a few minutes, he feels in his mouth a very diſagreeable braſſy taſte, which continues all the time he remains in the veſſel; ſo that, on this account, copper ſeems by no means an eligible material. This taſte moſt probably ariſes from the action of the alkaleſcent effluvia of the body upon the copper; for volatile alkali is a ſtrong diſſolvent of this metal: but how theſe effluvia volatiliſe the copper in ſuch a manner as to make the taſte of it ſenſible in the mouth, it is not eaſy to ſay.

DIVINITY, properly ſignifies the nature, quality, and eſſence of God.

Divinity, is alſo uſed in the ſame ſenſe with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of a ſeparation or diſunion from each other.

The Peripatetics and Carteſians hold diviſibility to be an affection of all matter. The Epicureans, again, allow it to agree to every phyſical continuum; but they deny that this affection agrees to all bodies, for the primary corpuſcles or atoms they maintain to be perfectly inſecable and indiviſible.

As it is evident that body is extended, ſo it is no leſs evident that it is diviſible: for ſince no two particles of matter can exiſt in the ſame place, it follows, that they are really diſtinct from each other; which is all that is meant by being diviſible. In this ſenſe the leaſt conceivable particle muſt ſtill be diviſible, ſince it will conſiſt of parts which will be really diſtinct. To illuſtrate this by a familiar inſtance. Let the leaſt imaginable piece of matter be conceived lying on a ſmooth plain ſurface, it is evident the ſurface will not touch it every where: thoſe parts therefore which it does not touch may be ſuppoſed ſeparable from the others, and ſo on as far as we pleaſe; and this is all that is meant when we ſay matter is infinitely diviſible.

Plate CLXII.

The infinite diviſibility of mathematical quantity is demonſtrated thus geometrically. Suppoſe the line AC perpendicular to BF; and another, as GH, at a ſmall diſtance from it, alſo perpendicular to the ſame line: with the centres CCC, &c. deſcribe circles cutting the line GH in the points *eee*, &c. Now the greater the radius AC is, the leſs is the part eH. But the radius may be augmented in infinitum; ſo long, therefore, the part eH may be divided into ſtill leſs portions; conſequently it may be divided in infinitum.

All that is ſuppoſed in ſtrict geometry (ſays Mr Maclaurin) concerning the diviſibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts equal to any given or propoſed number. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, becauſe no given number is ſo great but a greater may be conceived and aſſigned: but there is not, therefore, any neceſſity of ſuppoſing the number of parts actually infinite; and if ſome have drawn very abſtruſe conſequences from ſuch a ſuppoſition, yet geometry ought not to be loaded with them.

How far matter may actually be divided, may in ſome meaſure be conceived from hence, that a piece of wire gilt with ſo ſmall a quantity as eight grains of gold, may be drawn out to a length of 13,000 feet, the whole ſurface of it ſtill remaining covered with gold. We have alſo a ſurpriſing inſtance of the minuteneſs of ſome parts of matter from the nature of light and viſion. Let a candle be lighted, and placed in an open plain, it will then be viſible two miles round; and conſequently was it placed two miles above the ſurface of the earth, it would fill with luminous particles a ſphere whoſe diameter was four miles, and that before it had loſt any ſenſible part of its weight. A quantity of vitriol being diſſolved, and mixed with 9000 times as much water, will tinge the whole; conſequently will be divided into as many parts as there are viſible portions of matter in that quantity of water. There are perfumes, which, without a ſenſible diminution of their quantity, ſhall fill a very large ſpace with their odoriferous particles; which muſt therefore be of an inconceivable ſmallneſs, ſince there will be a ſufficient number in every part of that ſpace ſenſibly to affect the organ of ſmelling. Dr Keill demonſtrates, that any particle of matter, how ſmall ſoever, and any finite ſpace, how large ſoever, being given, it is poſſible for that ſmall particle of matter to be diffuſed through all that ſpace, and to fill it in ſuch a manner, as that there ſhall be no pore in it whoſe diameter ſhall exceed any given line.

The chief objections againſt the diviſibility of matter in infinitum are, That an infinite cannot be contained by a finite; and that it follows from a diviſibility in infinitum, either that all bodies are equal, or that one infinite is greater than another. But the anſwer to theſe is eaſy; for the properties of a determined quantity are not to be attributed to an infinite conſidered in a general ſenſe; and who has ever proved that there could not be an infinite number of infinitely ſmall parts in a finite quantity, or that all infinites are equal? The contrary is demonſtrated by mathematicians in innumerable inſtances. See the article Infinite, and *'S Graveſande Elem. Mathem.* l. i. c. 4.

DIVISION, in general, is the ſeparating a thing into two or more parts.

Mechanical Division, ſignifies that ſeparation which is occaſioned in the parts of a body by help of mechanical inſtruments.—The mechanical diviſion of bodies does indeed ſeparate them into ſmaller, homogeneous, ſimilar parts; but this ſeparation cannot extend to the primary integrant molecules of any body; and conſequently is incapable of breaking what is properly called their *aggregation:* alſo, no union is formed betwixt the divided and dividing bodies, in which reſpect diviſion eſſentially differs from diſſolution.

Diviſion is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly ſolution. For this purpoſe it is very uſeful, as it increaſes the quantity of ſurface, and conſequently the points of contact of any body.—Different methods are uſed to divide bodies according to their nature. Thoſe which are tenacious and elaſtic, as horns and gums, require to be cut, raſped, or filed. Metals, becauſe of their ductility, require the ſame treatment: but as they are alſo fuſible, they may be quickly and conveniently reduced into grains ſmall enough for moſt operations, by pouring them, when melted, into water. All brittle bodies may be reduced conveniently into fine parts by being bruiſed in a mortar with a peſtle. Very hard bodies, ſuch as glaſs, cryſtals, ſtones, particularly thoſe of the vitrifiable kind, before they are pounded, ought to be plunged when red-hot into water, by which they are ſplit and cracked, and rendered more eaſily pulverable. Bodies of this kind may alſo be bruiſed or ground by means of a hard and flat ſtone, upon which the matter is to be put, and bruiſed by another hard ſtone ſo ſmall as to be held and moved upon the larger ſtone with the hand. The larger ſtone is called a *porphyry*, from its being generally of that kind of ſtone; and the operation is called *porphyriſation*. Inſtead of porphyriſation, a mill may be uſed, compoſed of a hard grit millſtone, moving round upon another ſtone of the ſame kind, which muſt be fixed: in the upper ſtone is a groove or channel, through which the matter to be ground paſſes. By this method a ſubſtance may be more quickly reduced to a fine powder than by porphyriſation: But theſe mills can be only employed for conſiderable quantities of matter.

Theſe methods of mechanically dividing bodies are attended with ſome practical inconveniences; the moſt conſiderable of which is, that ſome parts of the dividing inſtruments are always ſtruck off, and mixed with the matter to be divided. This may greatly affect the operations. For inſtance, inſtruments of iron and copper furniſh metallic colouring particles, and copper is very prejudicial to health. Porphyry is coloured by a reddiſh brown matter, which injures the colour of cryſtal glaſſes, enamels, and porcelains made with matters ground upon this ſtone. Theſe matters therefore muſt be cleanſed after their porphyriſation, or elſe no inſtruments capable of injuring the intended operations ought to be employed. Thus, for the preparation of all medicines to be taken internally, no copper inſtruments, as mortars, peſtles, &c. ought to be uſed; thoſe made of iron are preferable; and inſtead of porphyries, mortars, grinding-ſtones and millſtones made of hard and white ſtones ought to be employed for ſubſtances which are to enter into the compoſition of enamels, cryſtal glaſs, and porcelain, the whiteneſs of which is a moſt neceſſary quality.

Diviſion, in algebra. See Algebra, p. 402. N° 102.

Diviſion, in arithmetic. See Arithmetic, n° 11.

Diviſions of an Army, in the military art, the ſeveral brigades and ſquadrons into which it is cantoned.

Diviſions of a Battalion, are the ſeveral platoons into which it is divided in marching or firing, each of which is commanded by an officer.

Diviſion, in ſea affairs, a ſelect number of ſhips in a fleet or ſquadron of men of war, diſtinguiſhed by a particular flag or pendant, and uſually commanded by a general officer. A ſquadron is commonly ranged into three diviſions, the commanding officer of which is always ſtationed in the centre.

When a fleet conſiſts of 60 ſail of the line, that is, of ſhips having at leaſt 60 cannon each, the admiral divides it into three ſquadrons, each of which has its diviſions and commanding officers. Each ſquadron has its proper colours, according to the rank of the admiral who commands it, and every diviſion its proper maſt. Thus the white flag denotes the firſt diviſion of France; the white and blue the ſecond; and the third is characteriſed by the blue. In Britain, the firſt admiral, or the admiral of the fleet, diſplays the union-flag at the main-top-maſt head; next follows the white flag with St George's croſs; and afterwards the blue. The private ſhips carry pendants of the ſame colour with their reſpective ſquadrons at the maſt of their particular diviſions; ſo that the laſt ſhip in the diviſion of the blue ſquadron carries a blue pendant at her mizen-top-maſt head.

DIVISOR, in arithmetic. See Arithmetic, n° 11.

DIUM (anc. geog.), a town of Chalcidice in Macedonia, near mount Athos. Alſo a promontory of Crete, on the north ſide of the iſland.—A third *Dium*, a promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cenæum, on the north-weſt ſide of the iſland, called alſo *Dia*.—A fourth *Dium* in Pieria of Macedonia, on the weſt ſide of the Sinus Thermaicus. Strabo and Livy place it on the borders of Pieria to the ſouth, at the foot of mount Olympus towards Theſſaly. That it was a ſplendid city, appears from Polybius; who relates, that its gymnaſium and walls were overthrown by the Ætolians. From which overthrow, however, it again recovered, Alexander adding new ſplendor to it, by the braſs ſtatues caſt by Lyſippus, and erected there in memory of the ſlain at the Granicus: an ornament which was continued down to the time of the Romans; who made it a colony, called *Dienſis*.—A fifth *Dium* beyond Jordan, near Pella in the Piræa.

DIVODURUM (anc. geog.), a town of the Mediomatrici in Gallia Belgica; ſituated on the Moſelle, in the ſpot where now Metz ſtands: now a city of Lorrain. E. Long. 6. 0. Lat. 49. 16.

DIVORCE, a breach or diſſolution of the bond of marriage. See Marriage; and Law, N° clx. 23.

Divorce is of two kinds: the one, *a vinculo matrimonii*, which alone is properly *divorce*; the other, *a menſa & thoro*, "a ſeparation from bed and board."

The woman divorced *a vinculo matrimonii* receives all again that ſhe brought with her: the other has a ſuitable ſeparate maintenance allowed her out of her huſband's effects. The firſt only happens thro' ſome eſſential impediment, as conſanguinity or affinity within the degrees forbidden, pre-contract, impotency, adultery, &c. of which impediments the canon law allows 14, comprehended in theſe verſes:

Error, conditio, votum, cognatio, crimen,
Cultus, diſparitas, vis, ordo, ligamen, honeſtas,
Si ſis affinis, ſi forte coire nequibis,
Si parochi & duplicis deſit præſentia teſtis,
Raptave ſit mulier, nec parti reddita tuta.

Divorce is a ſpiritual judgment, and therefore is paſſed in the ſpiritual court. Under the old law, the woman divorced was to have of her huſband a writing, as St Jerom and Joſephus teſtify, to this effect: *I promiſe, that hereafter I will lay no claim to thee;* which was called a *bill of divorce.*

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenneſs, age, diſeaſe, madneſs, and baniſhment, were the ordinary cauſes of divorce. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the conſulſhip of M. Attilius, and P. Valerius, was the firſt who put away his wife becauſe ſhe was barren; though Plutarch, in his Roman Queſtions, maintains, that Domitian was the firſt who permitted divorce. Juſtinian afterwards added impotence, a vow of chaſtity, and the profeſſion of a monaſtic life, as valid reaſons of divorce.

The Roman lawyers diſtinguiſh between *repudium* and *divortium;* making the former to be the breaking of a contract or eſpouſal, and the latter ſeparation after matrimony. Romulus enacted a ſevere law, which ſuffered not a wife to leave her huſband, but gave the man the liberty of turning off his wife, either upon poiſoning her children, counterfeiting his private keys, or for the crime of adultery; but if the huſband on any other occaſion put her away, he ordered one moiety of his eſtate for the wife, and the other to the goddeſs Ceres: beſides an atonement to the gods of the earth. However, in later times, the women as well as the men might ſue a divorce. The common way of divorcing was by ſending a bill to the woman, containing the reaſons of ſeparation, and the tender of all her goods which ſhe brought with her: and this was called *repudium mittere;* or elſe it was performed in her preſence, and before ſeven witneſſes, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: The Cretans allowed divorce to any man that was afraid of having too many children. The Spartans ſeldom divorced their wives; and it was extremely ſcandalous for a woman to depart from her huſband. The Athenians allowed divorce on very ſmall grounds, by a bill, containing the reaſon of the divorce, and approved, if the party appealed, by the chief magiſtrate; and women alſo were allowed to leave their huſbands on juſt occaſions. Perſons divorcing their wives were obliged to return their portions; otherwiſe, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expreſſing the ſeparation of men and women from each other were different; the men were ſaid αποπεμπειν or απολυειν, *to diſmiſs their wives;* but wives, απολειπειν, *to leave their huſbands.*

"The law of Moſes (Mr Paley obſerves), for reaſons of local expediency, permitted the Jewiſh huſband to put away his wife; but whether for every cauſe, or for what cauſe, appears to have been controverted amongſt the interpreters of thoſe times. Chriſt, the precepts of whoſe religion were calculated for more general uſe and obſervation, revokes this permiſſion, as given to the Jews 'for their hardneſs of hearts,' and promulges a law which was thenceforward to confine divorces to the ſingle cauſe of adultery in the wife: 'Whoſoever ſhall put away his wife, except it be for fornication, and ſhall marry another, committeth adultery; and who ſo marrieth her which is put away, doth commit adultery.' Matt. xix. 9.

Paley's Moral and Political Philoſophy, p. 273.

"Inferior cauſes may juſtify the ſeparation of huſband and wife, although they will not authoriſe ſuch a diſſolution of the marriage contract as would leave either at liberty to marry again: for it is that liberty in which the danger and miſchief of divorces principally conſiſt. The law of this country, in conformity to our Saviour's injunction, confines the diſſolution of the marriage contract to the ſingle caſe of adultery in the wife; and a divorce even in that caſe can only be brought about by the operation of an act of parliament, founded upon a previous ſentence in the ſpiritual court, and a verdict againſt the adulterer at common law: which proceedings taken together compoſe as complete an inveſtigation of the complaint as a cauſe can receive. It has lately been propoſed to the legiſlature to annex a clauſe to theſe acts, reſtraining the offending party from marrying with the companion of her crime, who by the courſe of proceeding is always known and convicted: for there is reaſon to fear, that adulterous connections are often formed with the proſpect of bringing them to this concluſion; at leaſt, when the ſeducer has once captivated the affection of a married woman, he may avail himſelf of this tempting argument to ſubdue her ſcruples, and complete his victory; and the legiſlature, as the buſineſs is managed at preſent, aſſiſts by its interpoſition the criminal deſign of the offenders, and confers a privilege where it ought to inflict a puniſhment. The propoſal deſerved an experiment; but ſomething more penal, it is apprehended, would be found neceſſary to check the progreſs of this alarming depravity. Whether a law might not be framed, directing *the fortune of the adultereſs to deſcend as in caſe of her natural death;* reſerving, however, a certain proportion of the produce of it, by way of annuity, for her ſubſiſtence (ſuch annuity in no caſe to exceed a certain ſum); and alſo ſo far ſuſpending the eſtate in the hands of the heir, as to preſerve the inheritance to any children ſhe might bear to a ſecond marriage, in caſe there was none to ſucceed in the place of their mother by the firſt: whether ſuch a law would not render female virtue in higher life leſs vincible, as well as the ſeducers of that virtue leſs urgent in their ſuit, I would recommend to the deliberation of thoſe who are willing to attempt the reformation of this important but moſt incorrigible claſs of the community. A paſſion for ſplendor, for expenſive amuſements and diſtinctions, is commonly found in that deſcription of women who would become the ſubjects of ſuch a law, not leſs inordinate than their other appetites. A ſeverity of the kind propoſed applies immediately to that paſſion. And there is no room for any complaint of injuſtice, ſince the proviſions

ſions above ſtated, with others which might be contrived, confine the puniſhment, ſo far as it is poſſible, to the perſon of the offender; ſuffering the eſtate to remain to the heir, or within the family of the anceſtor from whom it came, or to attend the appointments of his will.

"Sentences of the eccleſiaſtical courts, which releaſe the parties *a vinculo matrimonii*, by reaſon of impuberty, frigidity, conſanguinity within the prohibited degrees, prior marriage, or want of the requiſite conſent of parents or guardians, are not diſſolutions of the marriage contract, but judicial declarations that there never was any marriage; ſuch impediment ſubſiſting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itſelf contains an exception of theſe impediments. The man and woman to be married are charged, "if they know any impediment why they may not be lawfully joined together, to confeſs it;" and aſſured, "that ſo many as are coupled together, otherwiſe than God's word doth allow, are not joined together by God, neither is their matrimony lawful;" all which is intended by way of ſolemn notice to the parties, that the vow they are about to make will bind their conſciences and authoriſe their cohabitation only upon the ſuppoſition that no legal impediment exiſt."

DIURETICS (from δια *by*, and ουρον *urine*), medicines which provoke a diſcharge by urine.

Such is water drank plentifully; white wine drank in a morning; alkali ſalts of all kinds; ſea-ſalt, ſal-gemmæ, nitre, borax, alum, tartar, ſal ammoniac, whey, ſour milk, lemon-juice, &c. Aqueous liquors are generally diuretic eſpecially if mixed with ſalt, and drank cold. Fermented liquors are the leaſt diuretic of all; and the leſs ſo, as they are the fatter. Sharp thin ſour wines, rheniſh, &c. as alſo acid ſpirits of vinegar, ſalt, ſulphur, alum, vitriol, &c. aſparagus, bitter almonds, ſmallage, eryngium, eupatorium, ſaſſafras, &c. are all diuretics.

DIURNAL, in aſtronomy, ſomething relating to day; in oppoſition to *nocturnal*, which regards the night.

DIVUS, DIVA, in antiquity, appellations given to men and women who had been deified, or placed in the number of the gods. See DEIFICATION, &c.

Hence it is, that on medals ſtruck for the conſecration of an emperor or empreſs, they give them the title of *divus* or *diva*: for example, DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIZZINESS, in medicine. See VERTIGO.

DO, in muſic, a note of the Italian ſcale, correſponding to *ut* of the common gamut. See MUSIC.

DOBSON (William), an eminent Engliſh portrait and hiſtory painter, born at London in 1610. He ſerved an apprenticeſhip with one Peck, a ſtationer and picture-dealer; and owed his improvement to the copying ſome pictures of Titian and Van Dyck, whoſe manner he always retained. He had farther obligations to the latter of theſe artiſts; for it is ſaid, that a picture of his painting being expoſed at a ſhop on Snow-hill, Van Dyck paſſing by was ſtruck with it exceedingly; and inquiring after the author, found him at work in a poor garret. Van Dyck had the generoſity to equip him in a manner ſuitable to his merit. He preſented him to king Charles I. who took him under his protection, kept him with him at Oxford all the time his majeſty continued in that city, and not only ſat to him ſeveral times for his picture, but cauſed the prince of Wales, prince Rupert, and moſt of the lords of his court, to do ſo too. Mr Dobſon, however, being ſomewhat looſe and irregular in his way of life, was far from improving the many opportunities he had of making his fortune; and died very poor in 1647, at his houſe in St Martin's Lane.

DOBUNI, or BODUNI; an ancient people of Britain, who poſſeſſed the territory which now forms the counties of Oxford and Glouceſter. Both the names of this Britiſh nation ſeem to have been derived from the low ſituation of a great part of the country which they inhabited: for both *Duvo* and *Bodun* ſignify "profound" or "low", in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the Britiſh nations who reſiſted the Romans under Julius Cæſar, which was probably owing to the diſtance of their country from the ſcene of action; and before the next invaſion under Claudius, they had been ſo much oppreſſed by their ambitious neighbours the Cattivellauni, that they ſubmitted with pleaſure to the Romans, in order to be delivered from that oppreſſion. Cogiduuus, who was at that time (as his name imports) prince of the Dobuni, recommended himſelf ſo effectually to the favour of the emperor Claudius, by his ready ſubmiſſion, and other means, that he was not only continued in the government of his own territories, but had ſome other ſtates put under his authority. This prince lived ſo long, and remained ſo ſteady a friend and ally to the Romans, that his ſubjects, being habituated to their obedience in his time, never revolted, nor ſtood in need of many forts or forces to keep them in ſubjection. This is certainly the reaſon that we meet with ſo few Roman towns and ſtations in the country anciently inhabited by the Dobuni. The Durocornovium of Antoninus, and the Corinium of Ptolemy, are believed by antiquaries to have been the ſame place, the capital of the Dobuni, and ſituated at Cirenceſter, in Glouceſterſhire, where there are many marks of a Roman ſtation. Clevum or Glevum, in the thirteenth iter of Antoninus, ſtood where the city of Glouceſter now ſtands; and Abone, in the fourteenth iter, was probably ſituated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province Britannia Prima.

DOCETÆ (from δοκειν *to appear*), in eccleſiaſtical hiſtory, the followers of Julius Caſſianus, one of the Valentinian ſect, towards the cloſe of the ſecond century, who revived a notion that had been adopted by a branch of the Gnoſtics, againſt whom St John, Ignatius, and Polycarp, had aſſerted the truth of the incarnation. They believed and taught, as their name imports, that the actions and ſufferings of Jeſus Chriſt were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magiſtrates and perſons employed in public buſineſs at Athens. It was performed publicly in the forum, where they were obliged to give account of themſelves and their paſt life before certain judges. Among ſeveral queſtions propoſed to them, we find the following: Whether they had been dutiful to their parents, had ſerved in the wars, and had a competent eſtate?

DOCIMASTIC ART, a name given to the art of eſſaying by operations in ſmall, the nature and quantity of metallic or other matters which may be obtained from mineral or other compound bodies. See REFINING and METALLURGY.

DOCIMENUM MARMOR, a name given by the ancients to a ſpecies of marble of a bright and clear white, much uſed in large and ſumptuous buildings, ſuch as temples and the like. It had its name from *Docimenos*, a city of Phrygia, afterwards called *Synaia*; near which it was dug, and from whence it was ſent to Rome. It was accounted little inferior to the Parian in colour, but not capable of ſo elegant a poliſh; whence it was leſs uſed by the ſtatuaries, or in other ſmaller works. The emperor Adrian is ſaid to have uſed this marble in building the temple of Jupiter; and many others of the great works of the Romans are of it.

DOCK, in botany. See RUMEX.

DOCK, in the manege, is uſed for a large caſe of leather, as long as the dock of a horſe's tail, which ſerves it for a cover. The French call the dock *trouſſequeue*. It is made faſt by ſtraps to the crupper, and has leathern thongs that paſs between his thighs, and along his flanks to the ſaddle-ſtraps, in order to keep the tail tight, and to hinder it from whiſking about.

DOCK, in maritime affairs, a ſort of broad and deep trench, formed on the ſide of a harbour, or on the banks of a river; and commodiouſly fitted either to build ſhips or receive them to be repaired and *breamed* therein. Theſe ſorts of docks have generally ſtrong flood-gates to prevent the flux of the tide from entering the dock while the ſhip is under repair.—There are likewiſe docks of another kind, called *wet docks*, where a ſhip can only be cleaned during the receſs of the tide, or in the interval between the time when the tide left her dry a-ground and the period when it again reaches her by the return of the flood. Docks of the latter kind are not furniſhed with the uſual flood-gates.

DOCK-Yards, certain magazines containing all ſorts of naval ſtores and timber for ſhip-building. In England, the royal dock-yards are at Chatham, Portſmouth, Plymouth, Deptford, Woolwich, and Sheerneſs. His majeſty's ſhips and veſſels of war are generally moored at theſe ports during the time of peace; and ſuch as want repairing are taken into the docks, examined, and refitted for ſervice.

The principal dock-yards are governed by a commiſſioner, reſident at the port; who ſuperintends all the muſters of the officers, artificers, and labourers, employed in the dock-yard and ordinary. He alſo controls their payment therein; examines the accounts; contracts, and draws bills on the navy-office to ſupply the deficiency of ſtores; and, finally, regulates whatever belongs to the dock-yard, maintaining due order in the reſpective offices.

Theſe yards are generally ſupplied from the northern crowns with hemp, pitch, tar, roſin, canvas, oak-plank, and ſeveral other ſpecies. With regard to the maſts, particularly thoſe of the largeſt ſize, they are uſually imported from New-England.

DOCTOR, a perſon who has paſſed all the degrees of a faculty, and is impowered to teach or practiſe the ſame: thus we ſay, doctor in divinity, doctor in phyſic, doctor of laws.

The eſtabliſhment of the *doctorate*, ſuch as now in uſe among us, is ordinarily attributed to Irnerius, who himſelf drew up the formulary. The firſt ceremony of this kind was performed at Bologna, in the perſon of Bulgarus, who began to profeſs the Roman law, and on that occaſion was ſolemnly promoted to the *doctorate*, *i. e.* inſtalled *juris utriuſque doctor*. But the cuſtom was ſoon transferred from the faculty of law to that of theology; the firſt inſtance whereof was given in the univerſity of Paris, where Peter Lombard and Gilbert de la Portree, the two chief divines of thoſe days, were created doctors in theology, *ſacræ theologiæ doctores*.

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's ſentences, about the year 1140; and affirms, that ſuch as explained that work to their ſcholars were the firſt that had the appellation of doctors. Others go much higher, and hold Bede to have been the firſt doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

To paſs doctor in divinity at Oxford, it is neceſſary the candidate have been four years bachelor of divinity. For doctor of laws, he muſt have been ſeven years in the univerſity to commence bachelor of law; five years after which he may be admitted doctor of laws. Otherwiſe, in three years after taking the degree of maſter of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which ſame method and time are likewiſe required to paſs the degree of doctor in phyſic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been ſeven years bachelor of divinity. Though in ſeveral of the colleges the taking of the bachelor of divinity's degree is diſpenſed with, and they may go out *per ſaltum*. To commence doctor in laws, the candidate muſt have been five years bachelor of law, or ſeven years maſter of arts. To paſs doctor in phyſic, he muſt have been bachelor in phyſic five years, or ſeven years maſter of arts. A doctor of the civil law may exerciſe eccleſiaſtical juriſdiction, though a layman, ſtat. 37 Hen. VIII. cap. 17. ſect. 4.

DOCTOR of the Law, a title of honour among the Jews. The inveſtiture, if we may ſo ſay, of this order was performed by putting a key and table-book in their hands; which is what ſome authors imagine our Saviour had in view, Luke xi. 52. when, ſpeaking of the doctors of the law, he ſays, "Wo unto you doctors of the law, for you have taken away the key of knowledge: you entered not in yourſelves, and them that were entering you hindered."

DOCTOR of the Church, a title given to certain of the fathers whoſe doctrines and opinions have been the moſt generally followed and authoriſed. We uſually reckon four doctors of the Greek church, and three of the Latin. The firſt are St Athanaſius, St Baſil, St Gregory Nazianzen, and St Chryſoſtom. The latter are

St Jerom, St Auguſtine, and Gregory the Great. In the Roman breviary there is a particular office for the doctors. It only differs from that of the confeſſors, by the anthem of the Magnificat, and the leſſons.

Doctor, is alſo an appellation adjoined to ſeveral ſpecific epithets, expreſſing the merit of ſome of the ſchoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St Bonaventure, the ſeraphic doctor; John Duns Scotus, the ſubtile doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

Doctor, Διδασκαλος, in the Greek church, is a particular officer, appointed to interpret part of the ſcriptures. He who interprets the Goſpels, is called *doctor of the Goſpels;* he who interprets St Paul's Epiſtles, *doctor of the Apoſtle:* he who interprets the Pſalms, *doctor of the Pſalter.*

Doctors-Commons. See *College of Civilians.*

DOCUMENT, in law, ſome written monument produced in proof of any thing aſſerted.

DODARTIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ.* The calyx is quinquedentated; the under lip of the corolla twice as long as the upper; the capſule bilocular and globoſe.

DODD (Dr William), an unfortunate Engliſh divine, eldeſt ſon of the Rev. William Dodd, many years vicar of Bourne in Lincolnſhire, was born May 29. 1729. He was ſent, at the age of 16, to the univerſity of Cambridge; and admitted, in the year 1745, a ſizar of Clare-Hall. In 1749-50 he took the degree of B. A. with great honour, being upon that occaſion in the liſt of wranglers. Leaving the univerſity, he imprudently married a Miſs Mary Perkins in 1751, was ordained a deacon the ſame year, prieſt in 1753, and ſoon became a celebrated and popular preacher. His firſt preferment was the lectureſhip of Weſt-Ham. In 1754 he was alſo choſen lecturer of St Olave's, Hart-Street; and in 1757 took the degree of M. A. at Cambridge. On the foundation of the Magdalen Hoſpital in 1758, he was a ſtrenuous ſupporter of that charity, and ſoon after became preacher at the chapel of it. By the patronage of Biſhop Squire, he in 1763 obtained a prebend of Brecon, and by the intereſt of ſome city-friends procured himſelf to be appointed one of the king's chaplains; ſoon after which, he had the education of the preſent earl of Cheſterfield committed to his care. In 1766 he went to Cambridge and took the degree of LL. D. At this period, the eſtimation in which he was held by the world was ſufficient to give him expectations of preferment, and hopes of riches and honours; and theſe he might probably have acquired, had he poſſeſſed a common portion of prudence and diſcretion. But, impatient of his ſituation, and eager for advancement, he raſhly fell upon means which in the end were the occaſion of his ruin. On the living of St George, Hanover-Square, becoming vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her aſſiſtance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr Dodd was diſmiſſed with diſgrace from his office of chaplain. From this period he lived neglected, if not deſpiſed; and his extravagance ſtill continuing, he became involved in difficulties, which tempted him to forge a bond from his late pupil lord Cheſterfield, Feb. 4. 1777, for L.4200, which he actually received: but being detected, he was tried at the Old Bailey, found guilty, and received ſentence of death; and, in ſpite of every application for mercy, was executed at Tyburn, June 27. 1777. Dr Dodd was a voluminous writer, and poſſeſſed conſiderable abilities, with little judgment and much vanity. An accurate liſt of his various writings is prefixed to his "Thoughts in Priſon," ed. 1781.

Nichol's Anecdotes of Boyer.

DODDER, in botany. See Cuscuta.

DODDRIDGE (Philip), D. D. an eminent Preſbyterian miniſter, was the ſon of Daniel Doddridge an oil-man in London, where he was born on the 26th of June 1702; and having completed the ſtudy of the claſſics in ſeveral ſchools, was, in 1719, placed under the tuition of the reverend Mr John Jennings, who kept an academy at Kilworth in Leiceſterſhire. He was firſt ſettled as a miniſter at Kilworth, where he preached to a ſmall congregation in an obſcure village: but, on Mr Jennings's death, ſucceeded to the care of his academy; and ſoon after was choſen miniſter of a large congregation of Diſſenters at Northampton, to which he removed his academy, and where the number of his pupils increaſed. He inſtructed his pupils with the freedom and tenderneſs of a father; and never expected nor deſired that they ſhould blindly follow his ſentiments, but encouraged them to judge for themſelves. He checked any appearance of bigotry and uncharitableneſs, and endeavoured to cure them by ſhowing what might be ſaid in defence of thoſe principles they diſliked. He died at Liſbon, whither he went for the recovery of his health; and his remains were interred in the burying-ground belonging to the Britiſh factory there; and a handſome monument was erected to his memory in the meeting-houſe at Northampton, at the expence of the congregation, on which is an epitaph written by Gilbert Weſt, Eſq. He wrote, 1. Free Thoughts on the moſt probable means of reviving the Diſſenting Intereſt. 2. The Life of Colonel James Gardiner. 3. Sermons on the Education of Children. 4. The Riſe and Progreſs of Religion in the Soul. 5. The Family Expoſitor, in 6 vols 4to, &c. And ſince the author's death, a volume of his Hymns have been publiſhed, and his Theological Lectures. Several of his works have been tranſlated into Dutch, German, and French.

DODECAGON, in geometry, a regular polygon conſiſting of twelve equal ſides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular ſolids, contained under twelve equal and regular pentagons.

DODECANDRIA (from δωδεκα *twelve,* and ανηρ *a man*); the name of the eleventh claſs in Linnæus's ſexual ſyſtem, conſiſting of plants with hermaphrodite flowers, that, according to the title, have twelve ſtamina or male organs. This claſs, however, is not limited with reſpect to the number of ſtamina. Many genera have ſixteen, eighteen, and even nineteen ſtamina; the eſſential character ſeems to be, that, in the claſs in queſtion, the ſtamina, however numerous, are inſerted into the receptacle: whereas in the next claſs, icoſandria, which is as little determined in point of number as the preſent, they are attached to the inſide of the calyx or flower-cup.

The orders in this claſs, which are ſix, are founded upon the number of the ſtyles, or female organs. Aſarabacca, mangoſtan, ſtorax, purple looſe-ſtriſe, wild Syrian rue, and purſlane, have only one ſtyle; agrimony and heliocarpus have two; burning thorny plant, and baſtard rocket, three; *glinus*, five; *illicium*, eight; and houſe-leek, twelve.

DODECAS, in botany: A genus of the trigynia order, belonging to the dodecandria claſs of plants. The calyx is half quadrifid, having the corolla above; the corolla quinquefid; the capſule unilocular, conjoined with the calyx.

DODECATHEON, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ*. The corolla is verticillated and reflexed; the ſtamina placed in the tube; the capſule unilocular and oblong.

DODO, in ornithology. See DIDUS.

DODONA, a town of Theſprotia in Epirus, or (according to others) in Theſſaly. There was in its neighbourhood a celebrated oracle of Jupiter. The town and temple of the god were firſt built by Deucalion, after the univerſal deluge. It was ſuppoſed to be the moſt ancient oracle of all Greece; and according to the traditions of the Egyptians mentioned by Herodotus, it was founded by a dove. Two black doves, as he relates, took their flight from the city of Thebes in Egypt; one of which flew to the temple of Jupiter Ammon, and the other to Dodona, where with an human voice they acquainted the inhabitants of the country that Jupiter had conſecrated the ground, which in future would give oracles. The extenſive grove which ſurrounded Jupiter's temple was endowed with the gift of prophecy; and oracles were frequently delivered by the ſacred oaks and the doves which inhabited the place. This fabulous tradition of the oracular power of the doves is explained by Herodotus, who obſerves that ſome Phenicians carried away two prieſteſſes from Egypt, one of which went to fix her reſidence at Dodona, where the oracle was eſtabliſhed. It may farther be obſerved, that the fable might have been founded upon the double meaning of the word τελειαι, which ſignifies *doves* in moſt parts of Greece, while in the dialect of the Epirots it implies *old women*. In ancient times the oracles were delivered by the murmuring of a neighbouring fountain; but the cuſtom was afterwards changed. Large kettles were ſuſpended in the air near a brazen ſtatue, which held a laſh in its hand. When the wind blew ſtrong, the ſtatue was agitated and ſtruck againſt one of the kettles, which communicated the motion to all the reſt, and raiſed that clattering and diſcordant din, which continued for a while, and from which the artifice of the prieſts drew the predictions. Some ſuppoſe that the noiſe was occaſioned by the ſhaking of the leaves and boughs of an old oak, which the ſuperſtition of the people frequently conſulted, and from which they pretended to receive oracles. It may be obſerved with more probability, that the oracles were delivered by the prieſts, who, by artfully concealing themſelves behind the oaks, gave occaſion to the ſuperſtitious multitude to believe that the trees were endowed with the power of prophecy. As the ſhip Argo was built with ſome of the oaks of the foreſt of Dodona, there were ſome beams which gave oracles to the Argonauts, and warned them againſt the approach of calamity. Within the foreſt of Dodona there was a ſtream and a fountain of cool water which had the power of lighting a torch as ſoon as it touched it. This fountain was totally dry at noon day, and was reſtored to its full courſe at midnight, from which time till the following noon it began to decreaſe, and at the uſual hour was again deprived of its waters. The oracles of Dodona were generally delivered by women.

DODONÆA, in botany: A genus of the monogynia order belonging to the octandria claſs of plants. The calyx is tetraphyllous; there is no corolla; the capſule trilocular and inflated; the ſeeds twofold.

DODONIAN, *Dodoneus*, in antiquity, an epithet given to Jupiter, becauſe he was worſhipped in a temple built in the foreſt of Dodona, where was the moſt famous, and (it is ſaid) the moſt ancient, oracle of all Greece. See DODONA.

DODONIDES, the prieſteſſes who gave oracles in the temple of Jupiter in Dodona. According to ſome traditions the temple was originally inhabited by ſeven daughters of Atlas, who nurſed Bacchus. Their names were Ambroſia, Eudora, Paſithoe, Pytho, Plexaure, Coronis, Tythe or Tyche. In the later ages the oracles were always delivered by three old women; which cuſtom was firſt eſtabliſhed when Jupiter enjoyed the company of Dione, whom he permitted to receive divine honour in his temple at Dodona. The Bœotians were the only people of Greece who received their oracles at Dodona from men, for reaſons which Strabo, l. 9. fully explains.

DODRANS, in antiquity, three-fourths of the as. See the article AS.

DODSLEY (Robert), a late eminent bookſeller, and ingenious writer, born at Mansfield in Nottinghamſhire, in the year 1703. He was not indebted to education for his literary fame, being originally a livery ſervant; but his natural genius, and early paſſion for reading, ſoon elevated him to a ſuperior ſtation. He wrote an elegant little ſatirical farce called *The Toy-ſhop*, which was acted with applauſe in 1735, and which recommended him to the patronage of Mr Pope. The following year he produced the *King and Miller of Mansfield*. The profits of theſe two farces enabled him to commence bookſeller, and his own merit procured him eminence in that profeſſion. He wrote ſome other dramatic pieces, and publiſhed a collection of his works in one vol. 8vo, under the modeſt title of *Trifles*; which was followed by *Public Virtue*, a poem in 4to. Beſide what he wrote himſelf, the public were obliged to him for exerting his judgment in the way of his buſineſs; he having collected ſeveral volumes of well-choſen *Miſcellaneous Poems* and *Fugitive Pieces*, whoſe brevity would elſe have endangered their being totally loſt to poſterity. He died in 1764.

DODWELL (Henry), a very learned controverſial writer, born at Dublin, but of Engliſh extraction, in 1641. He wrote an incredible number of tracts: but his ſervices were ſo little acknowledged, that biſhop Burnet and others accuſe him of doing more hurt than good.

good to the cauſe of Chriſtianity, by his indiſcreet love of paradoxes and novelties, and thus expoſing himſelf to the ſcoffs of unbelievers. His pamphlet on the immortality of the ſoul gave riſe to the well known controverſy between Mr Collins and Dr Clark on that ſubject. He died in 1711.

DOESBURG, a town of the united provinces, in the county of Zutphen and province of Guelderland. It is ſmall, but well peopled, and very ſtrong both by art and nature, having the river Yſſel on one ſide, and a moraſs on the other, and is only to be approached by a narrow neck of land. E. Long. 5. 55. N. Lat. 52. 3.

DOG, in zoology: An animal remarkable for its natural docility, fidelity, and affection for its maſter; which qualities mankind are careful to improve for their own advantage. Theſe uſeful creatures guard our houſes, gardens, and cattle, with ſpirit and vigilance. By their help we are enabled to take not only beaſts, but birds; and to purſue game both over land and through the waters. In ſome northern countries, they ſerve to draw ſleds, and are alſo employed to carry burdens. In ſeveral parts of Africa, China, and by the Weſt Indian negroes, dogs are eaten, and accounted excellent food. Nay, we have the teſtimony of Mr Forſter, that dogs fleſh, in taſte, exactly reſembles mutton *. They were alſo uſed as food by the Romans, and long before them by the Greeks, as we learn from ſeveral treatiſes of Hippocrates. In the preſent times, their ſkins, dreſſed with the hair on, are uſed in muffs, made into a kind of buſkins for perſons in the gout, and for other purpoſes. Prepared in another way, they are uſed for ladies gloves, and the linings of maſks, being thought to make the ſkin peculiarly white and ſmooth. The French import many of theſe ſkins from Scotland, under a ſmall duty. Here, when tanned, they ſerve for upper leathers for neat pumps. Dogs ſkins dreſſed are exported under a ſmall, and imported under a high, duty. The French import from Denmark large quantities of dogs hair, both white and black. The laſt is eſteemed the beſt, and is worked up in the black liſt of a particular kind of woollen cloth; but is not uſed, as many have ſuppoſed, in making of hats, being entirely unfit for this purpoſe.

* See America, n° 90.

With regard to the qualities of dogs, thoſe bred in the iſland of Britain are juſtly reckoned ſuperior to the dogs bred in any other country. The ſwiftneſs of the gre-hound is amazing: as are alſo the ſteadineſs and perſeverance of other hounds and beagles; the boldneſs of terriers in unearthing foxes, &c.; the ſagacity of pointers and ſetting dogs, who are taught a language by ſigns as intelligible to ſportſmen as ſpeech; and the invincible ſpirit of a bull-dog, which can be quelled only by death.—All the nations in Europe not only do juſtice to the ſuperior qualities of the Britiſh dogs, but adopt our terms and names, and thankfully receive the creatures as preſents.—It is remarkable, however, that almoſt every kind of Britiſh dogs degenerates in foreign countries; nor is it poſſible to prevent this degeneracy by any art whatever.

For the natural hiſtory of the dog, ſee Canis.

Chooſing of Dogs. In order to chooſe a dog and bitch for good whelps, take care that the bitch come of a generous kind, be well proportioned, having large ribs and flanks; and likewiſe that the dog be of a good breed and young, for a young dog and an old bitch breed excellent whelps.

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The beſt time for hounds nitches, or bratchets, to be lined in, are the months of January, February, and March. The bitch ſhould be uſed to a kennel, that ſhe may like it after her whelping, and ſhe ought to be kept warm. Let the whelps be weaned after two months old; and though it be ſome difficulty to chooſe a whelp under the dam that will prove the beſt of the litter, yet ſome approve that which is laſt, and account him to be the beſt. Others remove the whelps from the kennel, and lay them ſeverally and apart one from the other; then they watch which of them the bitch firſt takes and carries into her kennel again, and that they ſuppoſe to be the beſt. Others again imagine that which weighs leaſt when it ſucks to be the beſt: this is certain, that the lighter whelp will prove the ſwifter. As ſoon as the bitch has littered, it is proper to chooſe them you intend to preſerve, and drown the reſt: keep the black, brown, or of one colour; for the ſpotted are not much to be eſteemed, though of hounds the ſpotted are to be valued.

Hounds for chaſe are to be choſen by their colours. The white, with black ears, and a black ſpot at the ſetting on of the tail, are the moſt principal to compoſe a kennel of, and of good ſcent and condition. The black hound, or the black tanned, or the all liver-coloured, or all white: the true talbots are the beſt for the ſtronger line; the grizzled, whether mixed or unmixed, ſo they be ſhag-haired, are the beſt verminers, and a couple of theſe are proper for a kennel.—In ſhort, take theſe marks of a good hound: That his head be of a middle proportion, rather long than round; his noſtrils wide, his ears large, his back bowed; his fillet great, his haunches large, thighs well truſſed, ham ſtrait, tail big near the reins, the reſt ſlender; the leg big, the ſole of the foot dry, and in the form of that of a fox, with large claws.

Keeping Dogs in Health.—As pointers and ſpaniels, when good of their kinds and well broken, are very valuable to a ſportſman, it is worth while to take ſome care to preſerve them in health. This very much depends on their diet and lodging: frequent cleaning their kennels, and giving them freſh ſtraw to lie on, is very neceſſary; or, in ſummer-time, deal-ſhavings, or ſand, inſtead of ſtraw, will check the breeding of fleas. If you rub your dog with chalk, and bruſh and comb him once or twice a-week, he will thrive much the better; the chalk will clear his ſkin from all greaſineſs, and he will be the leſs liable to be mangy. A dog is of a very hot nature: he ſhould therefore never be without clean water by him, that he may drink when he is thirſty. In regard to their food, carrion is by no means proper for them: it muſt hurt their ſenſe of ſmelling, on which the excellence of theſe dogs greatly depends. Barley meal, the droſs of wheat flour, or both mixed together, with broth or ſkimmed milk, is very proper food. For change, a ſmall quantity of greaves from which the tallow is preſſed by the chandlers, mixed with flour, or ſheep's feet well baked or boiled, are a very good diet; and when you indulge them with fleſh, it ſhould always be boiled. In the ſeaſon of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you intend to take them

out

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out except a little milk. If you ſtop for your own refreſhment in the day, you ſhould alſo refreſh your dogs with a little bread and milk. It has been already obſerved that dogs are of a hot conſtitution; the greateſt relief to them in the ſummer is twitch-graſs, or dog-graſs, which is the ſame thing. You ſhould therefore plant ſome of it in a place where you can turn them into every morning: they will feed freely on it to be cured of the ſickneſs they are ſubject to, and cured of any extraordinary heat of blood: but unleſs the graſs be of this ſort, it will have no effect.

Diſeaſes of Dogs.—1. *Bites and Stings.* If dogs are bitten by any venomous creatures, as ſnakes, adders, &c. ſqueeze out the blood, and waſh the place with ſalt and urine; then lay a plaſter to it made of calamint, pounded in a mortar, with turpentine and yellow wax, till it come to a ſalve. If you give your dog ſome of the juice of calamint to drink in milk, it will be good; or an ounce of treacle diſſolved in ſome ſweet wine.

2. *Mange.* Dogs are ſubject to the mange from being fed too high, and allowed no exerciſe or an opportunity of refreſhing themſelves with dog-graſs; or by being ſtarved at home, which will cauſe them to eat the vileſt ſtuff abroad, ſuch as carrion, or even human excrement; or by want of water, and ſometimes by not being kept clean in their kennel, or by foundering and melting in their greaſe. Either of theſe will heat the blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving ſtone-brimſtone powdered fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of ſome of the brimſtone and pork-lard, to which add a ſmall quanity of oil of turpentine.—Or, boil four ounces of quickſilver in two quarts of water to half the quantity; bathe them every day with this water, and let them have ſome of it to lick till the cure is perfected. Or, a ſmall quantity of trooper's ointment rubbed on the parts on its firſt appearance will cure it. It will alſo free louſy puppies from their lice. Or, take two ounces of euphorbium; flour of ſulphur, Flanders oil of bays, and ſoft ſoap, each four ounces. Anoint and rub your dog with it every other day; give him warm milk, and no water. The cure will be performed in about a week. The following receipt is alſo ſaid to be efficacious. Take two handfuls of wild creſſes, and as much elecampane, and alſo of the leaves and roots of roerb and ſorrel, and two pounds of the roots of ſodrels: boil all theſe well together in lee and vinegar; ſtrain the decoction, and put into it two pounds of grey ſoap, and when it is melted, rub the dog with it four or five days ſucceſſively, and it will cure him.

3. *Poiſon.* If you ſuſpect your dog to be poiſoned with nux vomica (the poiſon uſually employed by the warreners, which cauſes convulſive fits and ſoon kills), the moſt effectual remedy, if immediately applied, is to give him a good deal of common ſalt; to adminiſter which, you may open his mouth, and put a ſtick acroſs to prevent the ſhutting it, whilſt you cram his throat full of ſalt, at the ſame time holding his mouth upwards; and it will diſſolve ſo that a ſufficient quantity will be ſwallowed to purge and vomit him. When his ſtomach is ſufficiently cleared by a free paſſage obtained by ſtool, give him ſome warm broth frequently, to prevent his expiring from faintneſs; and he will recover.

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4. *Worms.* Dogs are very frequently troubled with worms; but more particularly whilſt they are young. Any thing bitter is ſo nauſeous to theſe worms, that they are very often voided by taking two or three purges of aloes; or (which is the ſame thing) Scots pills, four or five being a doſe for a large dog: this is to be repeated two or three times in a week. If this do not ſucceed, you may give him an ounce of powder of tin mixed up with butter, in three doſes; which ſeldom fails to cure. Or of the herb ſavin, dried and rubbed to powder, give about as much as will lie on a ſhilling for a doſe; which will entirely deſtroy worms and their ſeed.

6. *Sore Feet.* A pointer ought not to be hunted oftener than two or three days in a week; and unleſs you take care of his feet, and give him good lodging as well as proper food, he will not be able to perform that through the ſeaſon. You ſhould therefore, after a hard day's hunting, waſh his feet with warm water and ſalt; and when dry, waſh them with warm broth, or beer and butter, which will heal their ſoreneſs, and prevent a ſettled ſtiffneſs from fixing.

7. *Strains, Blows, or ſmall Wounds.* If your dog has received any little wounds by forcing through hedges, or gets any lameneſs from a blow or ſtrain; bathe the wound or grieved part with ſalt and cold vinegar (for warming it only evaporates the fine ſpirit); and when dry, if a wound, you may pour in it a little friar's balſam, which will perform the cure ſooner than any method hitherto experienced.

8. *Coughs and Colds.* Dogs are very ſubject to a cough, with an extraordinary choaking, which is thought to ariſe generally from a cold or ſome inward diſorder; and probably it is often occaſioned by their eating of fiſh-bones. To guard againſt it, order your ſervants to throw all ſuch fiſh-bones where the dog can't get at them. But if the diſorder be from a cold, let bleeding be repeated in ſmall quantities, if neceſſary; but if it be what is called the *diſtemper* in dogs, and they appear to be very low in ſpirits, the bleeding is better omitted. Let meat-broth, or milk-broth warmed, be the principal part of his diet, uſing at the ſame time the following medicine. Take flour of ſulphur, cold drawn linſeed oil, and ſalt-petre, of each an ounce; divide it into four doſes, giving him one doſe every other day, and let him have plenty of clean ſtraw to lie on; or one ſpoonful of honey daily.

Dog-Madneſs. Of this there are no leſs than ſeven ſorts common among dogs. The chief cauſes are, high-feeding, want of exerciſe, fulneſs of blood, and coſtiveneſs. As for the two firſt, you muſt obſerve when you hunt them, that they ſhould be better fed than when they reſt; and let them be neither too fat nor too lean; but, of the two, rather fat than lean; by which means they will not only be preſerved from madneſs but alſo from the mange and ſcab: which diſeaſes they will be ſubject to for want of air, water, or exerciſe; but if you have but the knowledge to keep them in an even temper, they may live long, and continue ſound. As for water, they ſhould be left to their own pleaſure; but for exerciſe and diet, it muſt be ordered according to diſcretion, obſerving a medium.

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um. Give them once a week, eſpecially in the heat of the year, five or ſix ſpoonfuls of ſalad oil, which will cleanſe them: at other times, the quantity of a hazelnut of mithridate is an excellent thing to prevent diſeaſes. It is alſo very good to bleed them under the tongue, and behind the ears.

The ſymptoms of madneſs are many and eaſily diſcerned. When any dog ſeparates himſelf contrary to his former uſe, becomes melancholy or droops his head, forbears eating, and as he runs ſnatches at every thing; if he often looks upwards, and his ſtern at his ſetting on be a little erect, and the reſt hanging down; if his eyes be red, his breath ſtrong, his voice hoarſe, and he drivels and foams at the mouth; you may be aſſured he has this diſtemper.

The ſeven ſorts of madneſs are as follow; of which the two firſt are incurable. 1. The hot burning madneſs. 2. The running madneſs. The animals labouring under theſe are peculiarly dangerous; for all things they bite and draw blood from will have the ſame diſtemper; and they generally ſeize on all they meet with, but chiefly on dogs: their pain is ſo great it ſoon kills them.—The five curable madneſſes are,

3. *Sleeping madneſs*, ſo called from the dog's great drowſineſs, and almoſt continual ſleeping. This is cauſed by the little worms that breed in the mouth of the ſtomach, from corrupt humours, vapours, and fumes which aſcend to the head: for cure of which, take ſix ounces of the juice of wormwood, two ounces of the powder of hartſhorn burnt, and two drams of agaric; mix all theſe together in a little white-wine, and give it the dog to drink in a drenching horn.

4. *Dumb madneſs*, lies alſo in the blood, and cauſes the dog not to feed, but to hold his mouth always wide open, frequently putting his feet to his mouth, as if he had a bone in his throat: to cure this, take the juice of black hellebore, the juice of *ſpatula putrida*, and of rue, of each four ounces; ſtrain them well, and put thereto two drams of unprepared ſcammony; and being mixed well together, put it down the dog's throat with a drenching horn, keeping his head up for ſome time, leſt he caſt it out again; then bleed him in the mouth, by cutting two or three veins in his gums.

It is ſaid, that about eight drams of the juice of an herb called *hartſhorn*, or *dog's tooth*, being given to the dog, cures all ſorts of madneſs.

5. *Lank madneſs*, is ſo called by reaſon of the dog's leanneſs and pining away. For cure give them a purge as before directed, and alſo bleed them: but ſome ſay there is no cure for it.

6. *Rheumatic* or *ſlavering madneſs*, occaſions the dog's head to ſwell, his eyes to look yellow, and he will be always ſlavering and driveling at the mouth. To cure which, take four ounces of the powder of the roots of polipody of the oak, ſix ounces of the juice of fennel-roots, with the like quantity of the roots of miſletoe, and four ounces of the juice of ivy: boil all theſe together in white-wine, and give it to the dog as hot as he can take it, in a drenching horn.

7. *Falling madneſs*, is ſo termed becauſe it lies in the dog's head, and makes him reel as he goes, and to fall down. For the cure, take four ounces of the juice of briony, and the ſame quantity of the juice of peony, with four drams of ſtaveſacre pulverized; mix theſe together, and give it the dog in a drenching horn; alſo let him blood in the ears, and in the two veins that come down his ſhoulders; and indeed bleeding is neceſſary for all ſorts of madneſs in dogs.

When a dog happens to be bit by a mad one, there is nothing better than their licking the place with their own tongues, if they can reach it; if not, then let it be waſhed with butter and vinegar, made luke-warm, and let it afterwards be anointed with Venice turpentine; but, above all, take the juice of the ſtalks of ſtrong tobacco boiled in water, and bathe the place therewith; alſo waſh him in ſea-water, or water artificially made ſalt: give him likewiſe a little mithridate inwardly in two or three ſpoonfuls of ſack; and ſo keep him apart; and if you find him after ſome time ſtill to droop, the beſt way is to hang him.

Some have aſſerted their having cured ſeveral creatures that have been bit by mad dogs, with only giving them the middle yellow bark of buckthorn; which muſt be boiled in ale for a horſe or cow, and in milk for a dog; but that it muſt be boiled till it is as bitter as you can take it.

As to the preventive of worming dogs, ſee WORMING.

Dog-Days. See CANICULA.

Dog-Fiſh, in ichthyology. See SQUALUS.

Dogs-Bane. See APOCYNUM.

Dog-Wood Tree. See PISCIDIA.

DOGE, the chief magiſtrate in the republics of Venice and Genoa.

The word properly ſignifies *duke*, being formed from the Latin *dux*; as *dogate*, and *dogado*, from *ducatus*, "duchy."

The dogate, or office and dignity of doge, is elective; at Venice, the doge is elected for life; at Genoa, only for two years; he is addreſſed under the title of *Serenity*, which among the Venetians is ſuperior to that of highneſs.

The doge is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their ſovereign, but only their firſt miniſter. In effect, the doge of Venice is no more than the phantom or ſhadow of the majeſty of a prince; all the authority being reſerved to the republic. He only lends his name to the ſenate; the power is diffuſed throughout the whole body, though the anſwers be all made in the name of the doge. If he gives any anſwers on his own account, they muſt be very cautiouſly expreſſed, and in general terms, otherwiſe he is ſure to meet with a reprimand. So that it is abſolutely neceſſary he be of an eaſy and pliable diſpoſition.

Anciently the doges were ſovereigns; but things are much altered; and at preſent, all the prerogatives reſerved to the quality of doge, are theſe which follow: he gives audience to ambaſſadors; but does not give them any anſwer from himſelf, in matters of any importance; only he is allowed to anſwer according to his own pleaſure, to the compliments they make to the ſignory; ſuch anſwers being of no conſequence. The doge, as being firſt magiſtrate, is head of all the councils; and the credentials which the ſenate furniſhes its miniſters in foreign courts, are written in his name; and yet he does not ſign them; but a ſecretary of ſtate ſigns them, and ſeals them with the arms of the republic. The ambaſſadors direct their diſpatches to the doge; and yet he may not open them but in preſence of the counſellors. The money is ſtruck in the doge's name, but not with his ſtamp or arms. All the magiſtrates riſe, and ſalute the doge when he comes into council; and the doge riſes to none but foreign ambaſſadors.

The doge nominates to all the benefices in the church of St Mark; he is protector of the monaſtery delle Virgine; and beſtows certain petty offices of uſhers of the houſehold, called *Commanders of the Palace*. His family is not under the juriſdiction of the maſter of the ceremonies; and his children may have ſtaff-officers, and gondoliers in livery.

His grandeur, at the ſame time, is tempered with a variety of circumſtances, which render it burdenſome. He may not go out of Venice without leave of the council; and if he does go out, he is liable to receive affronts, without being intitled to demand ſatisfaction; and, if any diſorder ſhould happen where he was, it belongs not to him, but to the podeſta, as being inveſted with the public authority, to compoſe it.

The children and brothers of the doge are excluded from all the chief offices of ſtate. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benifice, nor including any juriſdiction. The doge may not diveſt himſelf of his dignity, for his eaſe; and after his death, his conduct is examined by three inquiſitors and five correctors, who ſift it with great ſeverity.

DOGGER, a Dutch fiſhing veſſel navigated in the German Ocean. It is generally employed in the herring fiſhery; being equipped with two maſts, *viz.* a main-maſt and a mizen-maſt, and ſomewhat reſembling a ketch. See the Plates at the article Ship.

DOGGERS, in the Engliſh alum works, a name given by the workmen to a ſort of ſtone found in the ſame mines with the true alum rock, and containing ſome alum, though not near ſo much as the right kind. The county of York, which abounds greatly with the true alum rock, affords alſo a very conſiderable quantity of theſe doggers; and in ſome places they approach ſo much to the nature of the true rock, that they are wrought to advantage.

DOGMA, a principle, maxim, tenet, or ſettled opinion, particularly with regard to matters of faith and philoſophy.

DOGMATICAL, ſomething belonging to a doctrine or opinion. A dogmatical philoſopher is one who aſſerts things poſitively; in oppoſition to a ſceptic, who doubts of every thing.

DOGMATISTS, a ſect of ancient phyſicians, of which Hippocrates was the firſt author. They are alſo called *logici*, "logicians," from their uſing the rules of logic in ſubjects of their profeſſion. They laid down definitions and diviſions; reducing diſeaſes to certain genera, and thoſe genera to ſpecies, and furniſhing remedies for them all; ſuppoſing principles, drawing concluſions, and applying thoſe principles and concluſions to particular diſeaſes under conſideration: in which ſenſe, the dogmatiſts ſtand contradiſtinguiſhed from empirics and methodiſts. They reject all medicinal virtues that they think not reducible to manifeſt qualities: but Galen hath long ago obſerved of ſuch men, that they muſt either deny plain matter of fact, or aſſign but very poor reaſons and cauſes of many effects they pretend to explain.

DOLCE (Carlo, or Carlino), a celebrated hiſtory and portrait painter, was born at Florence in 1616, and was the diſciple of Vignali. This great maſter was particularly fond of repreſenting pious ſubjects, though he ſometimes painted portraits; and his works are eaſily diſtinguiſhed by the peculiar delicacy with which he perfected all his compoſitions, by a pleaſing tint of colour, and by a judicious management of the chiaro ſcuro. His performance was remarkably ſlow; and it is reported that his brain was fatally affected by ſeeing Luca Jordana diſpatch more buſineſs in four or five hours than he could have done in as many months. He died in 1686.

DOLE, in the Saxon and Britiſh tongue, ſignified a a part or portion, moſt commonly of a meadow, where ſeveral perſons have ſhares. It alſo ſtill ſignifies a diſtribution or dealing of alms, or a liberal gift made by a great man to the people.

Dole, in Scots law, ſignifies a malevolent intention. It is eſſential in every crime, that it be committed intentionally, or by an act of the will: hence the rule, *Crimen dolo contrahitur*.

DOLICHOS, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The baſis of the vexillum has two callous knobs, oblong, parallel, and compreſſing the alæ below. There are 25 ſpecies; the moſt remarkable of which are the following.

1. The lablab, with a winding ſtalk, is a native of warm climates, where it is frequently cultivated for the table. Mr Haſſelquiſt informs us, that it is cultivated in the Egyptian gardens, but is not a native of that country. The Egyptians make pleaſant arbours with it in their houſes and gardens, by ſupporting the ſtem and leading it where they think proper. They not only ſupport it with ſticks and wood, but tie it with cords; by which means the leaves form an excellent covering, and an agreeable ſhade.

2. The ſoja is a native of Japan, where it is termed *daidſu;* and, from its excellence, *mame;* that is, "the legumen or pod," by way of eminence. It grows with an erect, ſlender, and hairy ſtalk, to the height of about four feet. The leaves are like thoſe of the garden kidney-bean*. The flowers are of a bluiſh white, and produced from the boſom of the leaves, and ſucceeded by briſtly hanging pods reſembling thoſe of the yellow lupine, which commonly contain two, ſometimes three, large white ſeeds. There is a variety of this kind, with a ſmall black fruit, which is uſed in medicine. Kempfer affirms, that the ſeeds of this when pounded and taken inwardly give relief in the aſthma. This legumen is doubly uſeful in the Japaneſe kitchens. It ſerves for the preparation of a ſubſtance named *miſo*, that is uſed as butter; and likewiſe a pickle celebrated among them under the name of *ſooju* or *ſoy*. To make the firſt, they take a meaſure of mame, or the beans produced by the plant: after boiling them for a conſiderable time in water, and to a proper degree of ſoftneſs, they

* See *Phaſeolus*.

they beat or bray them into a ſoftiſh pulſe; incorporating with it, by means of repeated braying, a large quantity of common ſalt, four meaſures in ſummer, in winter three. The leſs ſalt that is added, the ſubſtance is more palatable; but what it gains in point of taſte, it loſes in durability. They then add to this mixture a certain preparation of rice, to which they give the name of *koos;* and having formed the whole into a compoſt, remove it into a wooden veſſel which had lately contained their common ale or beverage named *ſacki*. In about two months it is fit for uſe. The koos gives it a grateful taſte; and the preparing of it, like the polenta of the Germans, requires the ſkilful hand of an experienced maſter. For this reaſon there are certain people who make it their ſole buſineſs to prepare the koos, and who ſell it ready made for the purpoſe of making miſo: a ſubſtance which cannot fail to be greatly valued in thoſe countries where butter from the milk of animals is unknown. To make ſooju or ſoy, they take equal quantities of the ſame beans boiled to a certain degree of ſoftneſs; of muggi, that is corn, whether barley or wheat, roughly ground; and of common ſalt. Having properly mixed the beans with the pounded corn, they cover up the mixture, and keep it for a day and a night in a warm place, in order to ferment; then putting the maſs into a pot, they cover it with the ſalt, pouring over the whole two meaſures and a half of water. This compound ſubſtance they carefully ſtir at leaſt once a-day, if twice or thrice the better, for two or three months: at the end of which time, they filtrate and expreſs the maſs, preſerving the liquor in wooden veſſels. The older it is, the better and the clearer; and if made of wheat inſtead of barley, greatly blacker. The firſt liquor being removed, they again pour water upon the remaining maſs; which, after ſtirring for ſome days, as before, they expreſs a ſecond time, and thus obtain an inferior ſort of ſoy.

3. The pruriens, or cow-itch, is alſo a native of warm climates. It hath a fibrous root, and an herbaceous climbing ſtalk, which is naked, dividing into a great number of branches; and riſes to a great height when properly ſupported. The leaves are alternate and trilobate, riſing from the ſtem and branches about 12 inches diſtant from each other. The footſtalk is cylindrical, from 6 to 14 inches long. From the axilla of the leaf deſcends a pendulous ſolitary ſpike, from 6 to 14 inches long, covered with long blood-coloured papilionaceous flowers, riſing by threes in a double alternate manner from ſmall fleſhy protuberances, each of which is a ſhort pedunculus of three flowers. Theſe are ſucceeded by leguminous, coriaceous pods, four or five inches long, crooked like an Italic *ſ;* denſely covered with ſharp hairs, which penetrate the ſkin, and cauſe great itching. This will grow in any ſoil in thoſe countries where it is a native: but is generally eradicated from all cultivated grounds; becauſe the hairs from the pods fly with the winds, and torment every animal they happen to touch. If it was not for this miſchievous quality, the beauty of its flowers would intitle it to a place in the beſt gardens. It flowers in the cool months, from September to March, according to the ſituation.—The ſpiculæ, or ſharp-hairs, of this plant, have been long uſed in South America in caſes of worms; and have of late been frequently employed in Britain. The ſpiculæ of one pod mixed with ſyrup or molaſſes, and taken in the morning faſting, is a doſe for an adult. The worms are ſaid to appear with the ſecond or third doſe; and by means of a purge in ſome caſes the ſtools are ſaid to have conſiſted almoſt entirely of worms; and in caſes of lumbrici, it is ſaid to produce a ſafe and effectual cure. Thoſe who have uſed it moſt, particularly Dr Bancroft and Dr Cochrane, affirm that they have never ſeen any inconvenience reſulting from the internal uſe of it, notwithſtanding the great uneaſineſs it occaſions on the ſlighteſt touch to any part of the ſurface.

DOLLAR, or Daller, a ſilver coin, nearly of the value of the Spaniſh piece of eight or French crown.

Dollars are coined in different parts of Germany and Holland; and have their diminutions, as ſemi-dollars, quarter dollars, &c. See *Money-Table*.

They are not all of the ſame fineneſs nor weight. The Dutch dollars are the moſt frequent. In the Levant they are called *aſlaini*, from the impreſſion of a lion thereon.

DOLPHIN, in ichthyology. See Delphinus.

Dolphin of the Maſt, a peculiar kind of wreath, formed of plaited cordage, to be faſtened occaſionally round the maſts, as a ſupport to the puddening, whoſe uſe is to ſuſtain the weight of the fore and main yards in caſe the rigging or chains by which thoſe yards are ſuſpended ſhould be ſhot away in the time of battle; a circumſtance which might render their ſails uſeleſs at a ſeaſon when their aſſiſtance is extremely neceſſary. See the article Puddening.

DOM, or Don, a title of honour, invented and chiefly uſed by the Spaniards, ſignifying *ſir* or *lord*.

This title, it ſeems, was firſt given to Pelayo, in the beginning of the eighth century. In Portugal no perſon can aſſume the title of *don* without the permiſſion of the king, ſince it is looked upon as a mark of honour and nobility. In France it is ſometimes uſed among the religious. It is an abridgment of *domnus*, from *dominus*.

Dom and Som, in old charters, ſignifies full property and juriſdiction.

DOMAIN, the inheritance, eſtate, or poſſeſſion of any one. See Demesne.

DOMAT (John), a celebrated French lawyer born in 1625, who obſerving the confuſed ſtate of the laws, digeſted them in 4 vols 4to, under the title of The Civil Laws in their natural order: for which undertaking, Louis XIV. ſettled on him a penſion of 2000 livres. Domat was intimate with the famous Paſcal, who left him his private papers at his death: he himſelf died in 1696.

DOME, in architecture, a ſpherical roof, or a roof of a ſpherical form, raiſed over the middle of a building, as a church, hall, pavilion, veſtibule, ſtair-caſe, &c. by way of crowning.

Dome, in chemiſtry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemiſphere or ſmall dome. Its uſe is to form a ſpace in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is conſiderably increaſed, which is obliged to enter by the aſh-hole, and to paſs through the fire, to ſupply the place of the air driven from the dome. The form of this piece renders it proper to reflect or reverberate a part of the flame upon the matters which are in the furnace, which has occaſioned this kind of furnace to be called a *reverberating* one. See Furnace.

Dome, or *Doom*, ſignifies judgment, ſentence, or decree. The homagers oath in the black book of Hereford ends thus: "So help me God at his holy *dome*, and by my trowthe."

DOMENICHINO, a famous Italian painter, born of a good family at Bologna in 1581. He was at firſt a diſciple of Calvart the Fleming, but ſoon quitted his ſchool for that of the Caraccis. He always applied himſelf to his work with much ſtudy and thoughtfulneſs; and never offered to touch his pencil but when he found a proper kind of enthuſiaſm upon him. His great ſkill in architecture alſo procured him the appointment of chief architect of the apoſtolical palace from Pope Gregory XV.; nor was he without a theoretical knowledge in muſic. He died in 1641.

DOMESDAY, or doomsday, Book, a moſt ancient record, made in the time of William I. ſurnamed the *Conqueror*, and containing a ſurvey of all the lands of England. It conſiſts of two volumes, a greater and a leſs. The firſt is a large folio, written on 382 double pages of vellum, in a ſmall but plain character; each page having a double column. Some of the capital letters and principal paſſages are touched with red ink; and ſome have ſtrokes of red ink run croſs them, as if ſcratched out. This volume contains the deſcription of 31 counties. The other volume is in quarto, written upon 450 double pages of vellum, but in a ſingle column, and in a large but very fair character. It contains the counties of Eſſex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancaſhire in the counties of York and Cheſter.

This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reaſon given for taking this ſurvey, as aſſigned by ſeveral ancient records and hiſtorians, was, that every man ſhould be ſatisfied with his own right, and not uſurp with impunity what belonged to another. But, beſides this, it is ſaid by others, that now all thoſe who poſſeſſed landed eſtates became vaſſals to the king, and paid him ſo much money by way of fee or homage in proportion to the lands they held. This appears very probable, as there was at that time extant a general ſurvey of the whole kingdom, made by order of king Alfred.

For the execution of the ſurvey recorded in domeſday book, commiſſioners were ſent into every county and ſhire; and juries ſummoned in each hundred, out of all orders of freemen, from barons down to the loweſt farmers. Theſe commiſſioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; alſo by whom it was held in the time of Edward the Confeſſor; the number of hides; the quantity of wood, of paſture, and of meadow-land; how many ploughs were in the demeſne, and how many in the tenanted part of it; how many mills, how many fiſh-ponds or fiſheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king William, and at the time of this ſurvey; alſo whether it was capable of improvement, or of being advanced in its value: they were likewiſe directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or ſlaves, and alſo the number and kinds of their cattle and live ſtock. Theſe inquiſitions being firſt methodized in the county, were afterwards ſent up to the king's exchequer.

This ſurvey, at the time it was made, gave great offence to the people; and occaſioned a jealouſy that it was intended for ſome new impoſition. But notwithſtanding all the precaution taken by the conqueror to have this ſurvey faithfully and impartially executed, it appears from indiſputable authority, that a falſe return was given in by ſome of the commiſſioners; and that, as it is ſaid, out of a pious motive. This was particularly the caſe with the abbey of Croyland in Lincolnſhire, the poſſeſſions of which were greatly underrated both with regard to quantity and value. Perhaps more of theſe pious frauds were diſcovered, as it is ſaid Ralph Flambard, miniſter to William Rufus, propoſed the making a freſh and more vigorous inquiſition; but this was never executed.

Notwithſtanding this proof of its falſehood in ſome inſtances, which muſt throw a ſuſpicion on all others, the authority of domeſday-book was never permitted to be called in queſtion; and always, when it hath been neceſſary to diſtinguiſh whether lands were held in ancient demeſne, or in any other manner, recourſe was had to domeſday-book, and to that only, to determine the doubt. From this definitive authority, from which, as from the ſentence pronounced at *domeſday*, or the day of judgment, there could be no appeal, the name of the book is ſaid to have been derived. But Stowe aſſigns another reaſon for this appellation; namely, that domeſday-book is a corruption of *domus Dei book*; a title given it becauſe heretofore depoſited in the king's treaſury, in a place of the church of Weſtminſter or Wincheſter, called *domus Dei*. From the great care formerly taken for the preſervation of this ſurvey, we may learn the eſtimation in which its importance was held. The dialogue de Scaccariis ſays, "*Liber ille* (domeſday) *ſigilli regis comes eſt individuus in theſauro.*" Until lately it has been kept under three different locks and keys; one in the cuſtody of the treaſurer, and the others in that of the two chamberlains of the exchequer. It is now depoſited in the chapter-houſe at Weſtminſter, where it may be conſulted on paying to the proper officers a fee of 6s. 8d. for a ſearch, and fourpence per line for a tranſcript.

Beſides the two volumes above mentioned, there is alſo a third made by order of the ſame king; and which differs from the others in form more than matter. There is alſo a fourth called *domeſday*, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewiſe called *domeſday*, which is the ſame with the fourth book already mentioned. King Alfred had a roll which he called *domeſday*; and the domeſday-book made by William the Conqueror referred to the time of Edward the Confeſſor, as that of king Alfred did to the time of Ethelred. The fourth book of domeſday having many pictures and gilt letters in the beginning relating to the time of king Edward the Confeſſor, this had led ſome into a falſe opinion that domeſday-book was compoſed in the reign of king Edward.

DOMESTIC, any man who acts under another, ſerving to compoſe his family; in which he lives, or is ſuppoſed to live, as a chaplain, ſecretary, &c. Sometimes domeſtic is applied to the wife and children; but very ſeldom to ſervants, ſuch as footmen, lacquies, porters, &c.

Domestic, *adj.* is ſometimes oppoſed to foreign. Thus "*domeſtic* occurrences" ſignify thoſe events which happen in our own country, in contradiſtinction to thoſe of which we receive intelligence from abroad.

In its more uſual acceptation, the term implies ſomething peculiar to *home* or *houſehold*. Thus we ſpeak of *domeſtic* happineſs or pleaſures: meaning the pleaſures enjoyed in the boſom of one's family; in oppoſition to thoſe found in the buſtle of public life, or deluſively ſought in the haunts of diſſipation.

The ſolace of domeſtic enjoyments has been coveted by the wiſeſt and greateſt of men. Senators and heroes have ſhut out the acclamations of an applauding world, to enjoy the prattling of their little ones, and to partake the endearments of family converſation. They knew that even their beſt friends, in the common intercourſe of life, were in ſome degree actuated by intereſted motives in diſplaying their affection; that many of their followers applauded them in hopes of reward; and that the giddy multitude, however zealous, were not always judicious in their approbation. But the attentions paid them at their fire-ſide, the ſmiles which exhilarated their own table, were the genuine reſult of undiſſembled love.

Knox's Eſſays, N° 40.

To purſue the obſervations of an elegant eſſayiſt: "The nurſery has often alleviated the fatigues of the bar and the ſenate-houſe. Nothing contributes more to raiſe the gently pleaſing emotions, than the view of infant innocence, enjoying the raptures of a game at play. All the ſentiments of uncontrouled nature diſplay themſelves to the view, and furniſh matter for agreeable reflection to the mind of the philoſophical obſerver. To partake with children in their little pleaſures, is by no means unmanly. It is one of the pureſt ſources of mirth. It has an influence in amending the heart, which neceſſarily takes a tincture from the company that ſurrounds us. Innocence as well as guilt is communicated and increaſed by the contagion of example. And the great Author of evangelical philoſophy has taught us to emulate the ſimplicity of the infantine age. He ſeems indeed himſelf to have been delighted with young children, and found in them, what he in vain ſought among thoſe who judged themſelves their ſuperiors, unpolluted purity of heart.

"Among the great variety of pictures which the vivid imagination of Homer has diſplayed throughout the Iliad, there is not one more pleaſing than the family-piece, which repreſents the parting interview between Hector and Andromache. It deeply intereſts the heart, while it delights the imagination. The hero ceaſes to be terrible, that he may become amiable. We admire him while he ſtands completely armed in the field of battle; but we love him more while he is taking off his helmet, that he may not frighten his little boy with its nodding plumes. We are refreſhed with the tender ſcene of domeſtic love, while all around breathes rage and diſcord. We are pleaſed to ſee the arm, which is ſhortly to deal death and deſtruction among a hoſt of foes, employed in careſſing an infant ſon with the embraces of paternal love. A profeſſed critic would attribute the pleaſing effect entirely to contraſt; but the heart has declared, previouſly to the inquiries of criticiſm, that it is chiefly derived from the ſatisfaction which we naturally take in beholding great characters engaged in tender and amiable employments.

"But after all that is ſaid of the purity and the ſolidity of domeſtic pleaſures, they unfortunately appear, to a great part of mankind, inſipid, unmanly, and capable of ſatisfying none but the weak, the ſpiritleſs, the inexperienced, and the effeminate. The pretenders to wit and modern philoſophy are often found to renounce the received opinions of prudential conduct; and, while they affect a ſuperior liberality, to regulate their lives by the moſt ſelfiſh principles. Whatever appears to have little tendency to promote perſonal pleaſure and advantage, they leave to be performed by thoſe ſimple individuals, who are dull enough, as they ſay, to purſue the journey of life by the ſtraight road of common ſenſe. It is true, they will allow, that the world muſt be repleniſhed by a perpetual ſucceſſion; and it is no leſs true, that an offspring, once introduced into the world, requires all the care of painful attention. But let the taſk be reſerved for meaner ſpirits. If the paſſions can be gratified without the painful conſequences of ſupporting a family, they eagerly ſeize the indulgence. But the toil of education they leave to thoſe whom they deem fools enough to take a pleaſure in it. There will always be a ſufficient number, ſay they, whoſe folly will lead them, for the ſake of a ſilly paſſion called virtuous love, to engage in a life of perpetual anxiety. The fool's paradiſe, they add with deriſion, will never be deſerted.

"Preſumptuous as are all ſuch pretenders to newly-invented ſyſtems of life and conduct, it is not to be ſuppoſed they will think themſelves ſuperior to Cicero. Yet Cicero, with all his liberality of mind, felt the tenderneſs of conjugal and paternal attachment, and acknowledged that, at one time, he received no ſatisfaction in any company but that of his wife, his little daughter, and, to uſe his own epithet, his HONIED young Cicero. The great Sir Thomas More, whom nobody will ſuſpect of narrowneſs of mind, who by a very ſingular treatiſe evinced that he was capable of thinking and of chooſing for himſelf, has left it on record that he devoted a great ſhare of his time, from the united motives of duty and delight, to the amuſement of his children.

"It will be objected by thoſe who pretend to have formed their ideas of life from actual obſervation, that domeſtic happineſs, however pleaſing in deſcription, like many a poetic dream, is but an alluring picture, deſigned by a good heart, and painted in glowing colours by a lively fancy. The conſtant company, they urge, even of thoſe we love, occaſions an inſipidity. Inſipidity grows into diſguſt. Diſguſt, long continued, ſours the temper. Peeviſhneſs is the natural conſequence. The domeſtic circle becomes the ſcene of diſpute. Mutual antipathy is ingenious in deviſing mutual torment. Sullen ſilence or malignant remarks fill up every hour, till the arrival of a ſtranger cauſes a temporary

porary reſtraint, and excites that good humour which ought to be diſplayed among thoſe whom the bonds of affection and blood have already united.

"Experience, indeed, proves that theſe remarks are ſometimes verified. But that there is much domeſtic miſery is no argument that there is no domeſtic happineſs, or that the evil may not be removed. Natural ſtupidity, natural ill temper, acquired ill habits, want of education, illiberal manners, and a neglect of the common rules of diſcretion, will render every ſpecies of intercourſe diſagreeable. When thoſe are united by connubial ties who were ſeparated by natural and inherent diverſity, no wonder if that degree of happineſs which can only reſult from a proper union, is unknown. In the forced alliance, which the poet of Venuſium mentions, of the ſerpent with the dove, of the tyger with the lamb, there can be no love. When we expatiate on the happineſs of the domeſtic groupe, we preſuppoſe that all who compoſe it are originally aſſimilated by affection, and are ſtill kept in union by diſcreet friendſhip. Where this is not the caſe, the cenſure muſt fall on the diſcordant diſpoſition of the parties, and not on the eſſential nature of family intercourſe.

"To form, under the direction of prudence, and by the impulſe of virtuous love, an early conjugal attachment, is one of the beſt ſecurities of virtue, as well as the moſt probable means of happineſs. The duties, which are powerfully called forth by the relations of huſband and father, are of that tender kind which inſpires goodneſs and humanity. He who beholds a woman whom he loves, and an helpleſs infant, looking up to him for ſupport, will not eaſily be induced to indulge in unbecoming extravagance, or devote himſelf to indolence. He who has a riſing family to introduce into a vicious world, will be cautious of ſetting a bad example, the contagion of which, when it proceeds from parental authority, muſt be irreſiſtibly malignant. Thus many who, in their individual and unconnected ſtate, would probably have ſpent a life not only uſeleſs to others, but profligate and careleſs in itſelf, have become valuable members of the community, and have arrived at a degree of moral improvement, to which they would not otherwiſe have attained.

"The contempt in which domeſtic pleaſures have in modern times been held, is a mark of profligacy. It is alſo a proof of a prevailing ignorance of real enjoyment. It argues a defect in taſte and judgment as well as in morals. For the general voice of the experienced has in all ages declared, that the trueſt happineſs is to be found at home."

DOMICILE, in Scots law, is the dwelling-place where a perſon lives with an intention to remain.

DOMIFYING, in aſtrology, the dividing or diſtributing the heavens into 12 houſes, in order to erect a theme, or horoſcope, by means of ſix great circles, called *circles of poſition.*

There are various ways of domifying: that of Regiomontanus, which is the moſt common, makes the circles of poſition paſs through the interſections of the meridian and the horizon: others make them paſs through the poles of the zodiac.

DOMINANT (from the Latin word *dominari* "to rule or govern"), among muſicians, is uſed either as an adjective or ſubſtantive; but theſe different acceptations are far from being indiſcriminate. In both ſenſes it is explained by Rouſſeau as follows.

The *dominant* or ſenſible chord is that which is practiſed upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a *dominant* chord, as ſoon as the ſeventh minor is added to it.

Dominant (ſubſt.). Of the three notes eſſential to the tone, it is that which is a fifth from the tonick. The tonick and the *dominant* fix the tone; in it they are each of them the fundamental ſound of a particular chord; whereas the mediant, which conſtitutes the mode, has no chord peculiar to itſelf, and only makes a part of the chord of the tonick.

Mr Rameau gives the name of *dominant* in general to every note which carries a chord of the ſeventh, and diſtinguiſhes that which carries the ſenſible chord by the name of a *tonick dominant;* but, on account of the length of the word, this addition to the name has not been adopted by artiſts: they continue ſimply to call that note a *dominant* which is a fifth from the tonick; and they do not call the other notes which carry a chord of the ſeventh *dominants*, but *fundamentals;* which is ſufficient to render their meaning plain, and prevents confuſion.

A *dominant*, in that ſpecies of church-muſic which is called *plain-chant*, is that note which is moſt frequently repeated or beaten, in whatever degree it may be from the tonick. In this ſpecies of muſic there are *dominants* and *tonicks*, but no mediant.

DOMINATION, or DOMINION, in theology, the fourth order of angels or bleſſed ſpirits in the hierarchy, reckoning from the ſeraphim. See ANGEL.

DOMINGO, or St DOMINGO, the capital of the iſland of Hiſpaniola in the Weſt Indies, is ſeated in that part belonging to the Spaniards on the ſouth ſide of the iſland, and has a commodious harbour. The town is built in the Spaniſh manner, with a great ſquare in the middle of it; about which are the cathedral and other public buildings. From this ſquare run the principal ſtreets, in a direct line, they being croſſed by others at right angles, ſo that the form of the town is almoſt ſquare. The country on the north and eaſt ſide is pleaſant and fruitful; and there is a large navigable river on the weſt, with the ocean on the ſouth. It is the ſee of an archbiſhop, an ancient royal audience, and the ſeat of the governor. It has ſeveral fine churches and monaſteries; and is ſo well fortified, that a fleet and army ſent by Oliver Cromwell in 1654 could not take it. The inhabitants are Spaniards, Negroes, Mulattoes, Meſtices, and Albatraces; of whom about a ſixth part may be Spaniards. It had formerly about 2000 houſes, but it is much declined of late years. The river on which it is ſeated is called *Ozama*. W. Long. 69. 30. N. Lat. 18. 25.

DOMINIC (de Guſman), founder of the Dominican order of monks, was born at Calaroga in Old Caſtile, 1170. He preached with great fury againſt the Albigenſes, when Pope Innocent III. made a croiſade againſt that unhappy people; and was inquiſitor in Languedoc, where he founded his order, and got it confirmed by the Lateran council in 1215. He died at Bologna in 1221, and was afterwards canonized. The dominican order has produced many illuſtrious men. See DOMINICANS.

DOMINICA, one of the Caribbee iſlands in the Weſt Indies, about 39 miles long and 13 broad, ſituated between 61° and 62° W. Long. and between 15° and 16° of N. Lat. This iſland formerly belonged to the French, but was ceded to Britain by the treaty in 1763. It is very advantageous to the latter, as being ſituated between the French iſlands of Gaudaloupe and Martinico, ſo that it is equally alarming to both; and its ſafe and commodious roads enable the Britiſh privateers to intercept, without riſk, the navigation of France in her colonies, whenever a war happens between the two nations.

This iſland was reduced, in the year 1778, by the French, under the marquis de Bouille, governor of Martinico. At that time the iſland, though very well fortified, had been unaccountably neglected by the Britiſh government, in ſuch a manner as to be almoſt entirely deſtitute of a garriſon. The French commander therefore, who made a deſcent with 2000 men, found only 100 regular forces and a few companies of militia to oppoſe him. All reſiſtance therefore being vain, the only thing the garriſon could do was to procure as favourable terms of capitulation as poſſible. Theſe were granted with ſuch readineſs as did great honour to the character of this officer; the inhabitants experiencing no kind of change except that of transferring their obedience from Britain to France, being left unmoleſted in the enjoyment of all their rights both civil and religious. The capitulation was ſtrictly obſerved by the Marquis; no plunder or irregularity being allowed, and a pecuniary gratification being diſtributed among the ſoldiers and volunteers who accompanied him in the expedition. An hundred and ſixty-four pieces of excellent cannon, and twenty-four braſs mortars, beſides a large quantity of military ſtores, were found in the place; inſomuch that the French themſelves expreſſed their ſurpriſe at finding ſo few hands to make uſe of them. The Marquis, however, took care to ſupply this defect, by leaving a garriſon of 1500 of the beſt men he had with him. It was reſtored to Britain at the concluſion of the peace in 1783.

La Dominica, one of the MARQUESAS Iſlands in the South-Sea.

DOMINICAL LETTER, popularly called *Sunday-Letter*, one of the ſeven letters A B C D E F G, uſed in almanacks, ephemerides, &c. to denote the Sundays throughout the year. See CHRONOLOGY, n° 32. The word is formed from *dominica* or *dominicus dies*, "Lord's-day, Sunday."

The dominical letters were introduced in the kalendar by the primitive Chriſtians, in lieu of the NUNDINAL letters in the Roman kalendar.

DOMINICAL, in church-hiſtory. The council of Auxerre, held in 578, decrees, that women communicate with their dominical. Some authors contend, that this dominical was a linen cloth, wherein they received the ſpecies; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The moſt probable account is, that it was a ſort of linen cloth or handkerchief wherein they received and preſerved the euchariſt in times of perſecution, to be taken on occaſion at home. This appears to have been the caſe by the practice of the firſt Chriſtians, and by Tertullian's book *Ad Uxorem*.

DOMINICANS, an order of religious, called in ſome places *Jacobins*; and in others, *Predicants*, or *Preaching Friers*.

The Dominicans take their name from their founder Dominic de Guzman, a Spaniſh gentleman, born in 1170, at Calaroga in Old Caſtile. He was firſt canon and archdeacon of Oſma; and afterwards preached with great zeal and vehemence againſt the Albigenſes in Languedoc, where he laid the firſt foundation of his order. It was approved of in 1215 by Innocent III. and confirmed in 1216 by a bull of Honorius III. under the tile of *St Auguſtin*; to which Dominic added ſeveral auſtere precepts and obſervances, obliging the brethren to take a vow of abſolute poverty, and to abandon entirely all their revenues and poſſeſſions; and alſo the title of *Preaching Friers*, becauſe public inſtruction was the main end of their inſtitution.

The firſt convent was founded at Tholouſe by the biſhop thereof and Simon de Montfort. Two years afterwards they had another at Paris, near the biſhop's houſe; and ſome time after a third in the rue St Jacques, St James's ſtreet, whence the denomination of *Jacobins*.

Juſt before his death, Dominic ſent Gilbert de Freſney, with twelve of the brethren, into England, where they founded their firſt monaſtery at Oxford in the year 1221, and ſoon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole ſtreets by the river Thames, where they erected a very commodious convent, whence that place is ſtill called *Black Friers*, from the name by which the Dominicans were called in England.

St Dominic, at firſt, only took the habit of the regular canons; that is, a black caſſock and rochet: but this he quitted in 1219, for that which they now wear, which it is pretended was ſhown by the bleſſed Virgin herſelf to the beatified Renaud d'Orleans.

This order is diffuſed throughout the whole known world. It has forty-five provinces under the general, who reſides at Rome; and twelve particular congregations or reforms, governed by vicars general.

They reckon three popes of this order, above ſixty cardinals, ſeveral patriarchs, a hundred and fifty archbiſhops, and about eight hundred biſhops; beſide maſters of the ſacred palace, whoſe office has been conſtantly diſcharged by a religious of this order, ever ſince St Dominic, who held it under Honorius III. in 1218.

Of all the monaſtic orders, none enjoyed a higher degree of power and authority than the Dominican friers, whoſe credit was great, and their influence univerſal. But the meaſures they uſed in order to maintain and extend their authority were ſo perfidious and cruel, that their influence began to decline towards the beginning of the ſixteenth century. The tragic ſtory of Jetzer, conducted at Bern in 1509, for determining an unintereſting diſpute between them and the Franciſcans, relating to the *immaculate conception*, will reflect indelible infamy on this order. See an account of it in Burnet's Travels through France, Italy, Germany, and Switzerland, p. 31. or Moſheim's Eccl. Hiſt. vol. iii. p. 294, 8vo. They were indeed perpetually employed in ſtigmatizing with the opprobrious name of hereſy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their poſſeſſions; and in laying the moſt iniquitous ſnares and ſtratagems for the deſtruction of their adverſaries. They were the principal counſellors, by whoſe inſtigation and advice Leo X. was determined to the public condemnation of Luther. The papal ſee never had more active and uſeful abettors than this order, and that of the Jeſuits.

The dogmata of the Dominicans are uſually oppoſite to thoſe of the Franciſcans.

There are alſo nuns or ſiſters of this order, called in ſome places *Preaching Siſters*. Theſe are even more ancient than the friers; St Dominic having founded a ſociety of religious maids at Prouilles ſome years before the inſtitution of his order of men; viz. in 1206.

There is alſo a third order of Dominicans, both for men and women.

DOMINION, DOMINIUM, in the civil law, ſignifies the power to uſe or diſpoſe of a thing as we pleaſe.

DOMINION, or *Domination*. See DOMINATION.

DOMINIS (Mark Anthony de), archbiſhop of Spalatro in Dalmatia at the cloſe of the 15th and beginning of the 16th centuries, was a man whoſe fickleneſs in religion proved his ruin. His preferment, inſtead of attaching him to the church of Rome, rendered him diſaffected to it. Becoming acquainted with our biſhop Bedell, while chaplain to Sir Henry Wotton ambaſſador from James I. at Venice, he communicated his books *De Republica Eccleſiaſtica* to him; which were afterwards publiſhed at London, with Bedell's corrections. He came to England with Bedell; where he was received with great reſpect, and preached and wrote againſt the Romiſh religion. He is ſaid to have had a principal hand in publiſhing father Paul's *Hiſtory of the Council of Trent*, at London, which was inſcribed to James in 1619. But on the promotion of Pope Gregory XIV. who had been his ſchool-fellow and old acquaintance, he was deluded by Gondomar the Spaniſh ambaſſador into the hopes of procuring a cardinal's hat, by which he fancied he ſhould prove an inſtrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at firſt well received: but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was impriſoned by Pope Urban VIII. and died in 1625. He was alſo the author of the firſt philoſophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM EMINENS, in Scots law, that power which the ſtate or ſovereign has over private property, by which the proprietor may be compelled to ſell it for an adequate price where public utility requires. See LAW, N° clxii. 1.

DOMINIUM Directum, in Scots law, the right which a ſuperior retains in his lands, notwithſtanding the feudal grant to his vaſſal. See LAW, N° clxvi. 1.

DOMINIUM Utile, in Scots law, the right which the vaſſal acquires in the lands by the feudal grant from his ſuperior. See LAW, N° clxvi. 1.

DOMINUS, in ancient times, a title prefixed to a name, uſually to denote the perſon either a knight or a clergyman. See *VICE-Dominus*.

The title was ſometimes alſo given to a gentleman not dubbed; eſpecially if he were lord of a manor. See DOM, GENTLEMAN, and SIRE.

In Holland, the title *dominus* is ſtill retained, to diſtinguiſh a miniſter of the reformed church.

DOMITIAN, the Roman emperor, ſon to Veſpaſian, was the laſt of the 12 Cæſars. See (*Hiſtory of*) ROME.

DON, or TANAIS, a river of Ruſſia, which takes its riſe from the ſmall lake of St John, near Tula, in the government of Moſcow, and paſſing through part of the province of Voronetz, a ſmall portion of the Ukraina-Slobodſkaia, and the whole province of Azof, divides itſelf near Tcherkaſk into three ſtreams, and falls in theſe ſeparate branches into the Sea of Azof. The river has ſo many windings, is in many parts ſo ſhallow, and abounds with ſuch numerous ſhoals, as to be ſcarcely navigable, excepting in the ſpring, upon the melting of the ſnows; and its mouth is alſo ſo choaked up with ſand, that only flat-bottomed veſſels, excepting in the ſame ſeaſon, can paſs into the ſea of Azof. The banks of the Don, and the rivulets which fall into it, are clothed with large tracts of foreſt, whoſe timber is floated down the ſtream to St Demetri and Roſtof, where the frigates for the ſea of Azof are chiefly conſtructed. The navigation of the Don, Mr Cox obſerves, may poſſibly hereafter be rendered highly valuable, by conveying to the Black Sea the iron of Siberia, the Chineſe goods, and the Perſian merchandize: which latter commodities, as well as the products of India, formerly found their way into Europe through this ſame channel.

DON is alſo the name of a river in Scotland, noticed under the article ABERDEEN; the Old Town being ſituated at its mouth. See ABERDEEN.

DONARIA, among the ancients, in its primary ſignification, was taken for the places where the oblations offered to the gods were kept; but afterwards was uſed to denote the offerings themſelves; and ſometimes, though improperly, the temples.

DONATIA, in botany: A genus of the trigynia order, belonging to the triandria claſs of plants. The calyx is a triphyllous perianthium, with ſhort ſubulated leaves ſtanding at a diſtance from one another. The corolla has from eight to ten petals of an oblong linear ſhape, twice as long as the calyx. The ſtamina are three ſubulated filaments the length of the calyx; the antheræ roundiſh, didymous, and two-lobed at the baſe.

DONATION, DONATIO, an act or contract whereby a man transfers to another either the property or the uſe of the whole or a part of his effects as a free gift.

A donation, to be valid and complete, ſuppoſes a capacity both in the donor and the donee; and requires conſent, acceptance, and delivery; and by the French law regiſtry alſo.

DONATION Mortis Cauſa, in law, a diſpoſition of property made by a perſon in his laſt ſickneſs, who apprehending his diſſolution near, delivers, or cauſes to be delivered to another, the poſſeſſion of any perſonal goods, to keep in caſe of his deceaſe. If the donor dies, this gift needs not the conſent of his executor; but it ſhall not prevail againſt creditors; and it is accompanied with this implied truſt, that, if the donor lives, the property ſhall revert to himſelf, being only given in proſpect of death, or *mortis cauſa*. This method of donation ſeems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

DONATISTS, ancient ſchiſmatics in Africa, ſo denominated from their leader Donatus.

They had their origin in the year 311, when, in the room of Menſurius, who died in that year on his return to Rome, Cæcilian was elected biſhop of Carthage, and conſecrated without the concurrence of the Numidian biſhops, by thoſe of Africa alone; whom the people refuſed to acknowledge, and to whom they oppoſed Majorinus; who, accordingly, was ordained by Donatus biſhop of Caſæ Nigræ. They were condemned, in a council held at Rome, two years after their ſeparation; and afterwards in another at Arles, the year following; and again at Milan, before Conſtantine the Great, in 316, who deprived them of their churches, and ſent their ſeditious biſhops into baniſhment, and puniſhed ſome of them with death. Their cauſe was eſpouſed by another Donatus, called the *great*, the principal biſhop of that ſect, who, with numbers of his followers, was exiled by order of Conſtans. Many of them were puniſhed with great ſeverity. See Circumcelliones. However, after the acceſſion of Julian to the throne in 362, they were permitted to return, and reſtored to their former liberty. Gratian publiſhed ſeveral edicts againſt them; and in 377 deprived them of their churches, and prohibited all their aſſemblies. But notwithſtanding the ſeverities they ſuffered, it appears that they had a very conſiderable number of churches towards the cloſe of this century; but at this time they began to decline, on account of a ſchiſm among themſelves, occaſioned by the election of two biſhops, in the room of Parmenian, the ſucceſſor of Donatus; one party elected Primian, and were called *Primianiſts*, and another Maximian, and were called *Maximianiſts*. Their decline was alſo precipitated by the zealous oppoſition of St Auguſtin, and by the violent meaſures which were purſued againſt them, by order of the emperor Honorius, at the ſolicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their biſhops were baniſhed, and ſome put to death. This ſect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took poſſeſſion of this province; but it ſunk again under new ſeverities, when their empire was overturned in 534. Nevertheleſs, they remained in a ſeparate body till the cloſe of this century, when Gregory, the Roman pontiff, uſed various methods for ſuppreſſing them; his zeal ſucceeded, and there are few traces to be found of the Donatiſts after this period. They were diſtinguiſhed by other appellations; as *Circumcelliones*, *Montenſes*, or *Mountaineers*, *Campites*, *Rupites*, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

The errors of the Donatiſts, beſide their ſchiſm, were, 1. That baptiſm conferred out of the church, that is, out of their ſect, was null; and accordingly they rebaptized thoſe who joined their party from other churches, and re-ordained their miniſters. 2. That theirs was the only true, pure, and holy church; all the reſt of the churches they held as proſtitute and fallen.

Donatus ſeems likewiſe to have given into the doctrine of the Arians, with whom he was cloſely allied; and, accordingly, St Epiphanius, Theodoret, and ſome others, accuſed the Donatiſts of Arianiſm; and it is probable that the charge was well founded, becauſe they were patronized by the Vandals, who were of theſe ſentiments. But St Auguſtine, ep. 185, to count Bonniface, & Hær. 69. affirms, that the Donatiſts, in this point, kept clear of the errors of their leader.

DONATIVE, Donativum, a preſent made by any perſon; called alſo *gratuity*.

The Romans made large donatives to their ſoldiers. Julia Pia, wife of the emperor Severus, is called on certain medals *mater caſtrorum*, becauſe of the care ſhe took of the ſoldiery, by interpoſing for the augmentation of their donatives, &c.

Donative was properly a gift made to the ſoldiery; as congiarium was that made to the people. Salmaſius, on his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, obſerves, that this was the common and legitimate rate of a donative. Caſaubon, in his notes on the Life of Pertinax by Capitolinus, obſerves, that Pertinax made a promiſe of 3000 denarii to each ſoldier; which amounts to upwards of 97 pounds ſterling. The ſame author writes, that the legal donative was 20,000 denarii; and that it was not cuſtomary to give leſs, eſpecially to the prætorian ſoldiers; that the centurions had double, and the tribunes, &c. more in proportion.

Donative, in the canon law, a benefice given, and collated to a perſon, by the founder or patron; without either preſentation, inſtitution, or induction by the ordinary.

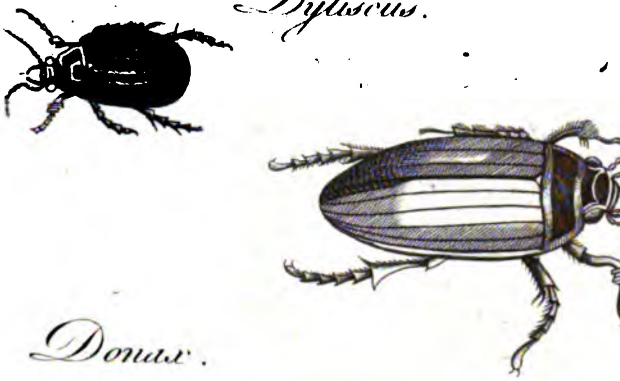
If chapels founded by laymen be not approved by the dioceſan, and, as it is called, *ſpiritualized*, they are not accounted proper benefices, neither can they be conferred by the biſhop, but remain to the pious diſpoſition of the founders; ſo that the founders, and their heirs, may give ſuch chapels without the biſhop.

Gwin obſerves, that the king might of ancient time found a free chapel, and exempt it from the juriſdiction of the dioceſan; ſo may he, by letters patent, give liberty to a common perſon to found ſuch a chapel, and make it donative, not preſentable; and the chaplain, or beneficiary, ſhall be deprivable by the founder or his heir, and not by the biſhop. And this ſeems to be the original of donatives in England.

Donatives are within the ſtatute againſt ſimony; and if they have cure of ſouls, within that againſt pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapſe thereof, unleſs it be ſpecially provided for in the foundation; but the biſhop may compel him to do it by ſpiritual cenſures. But if it be augmented by queen Anne's bounty, it will lapſe like other preſentative livings. 1 Geo. I. ſtat. 2.

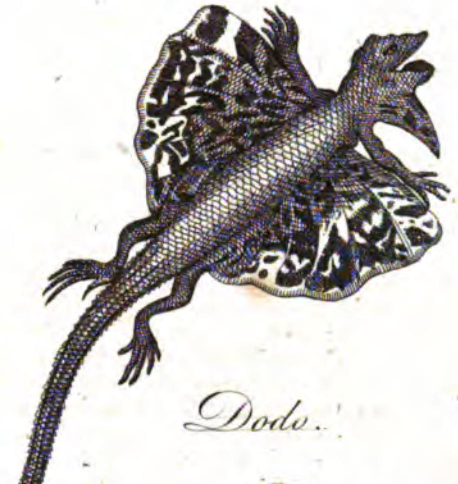
Plate CLXIV.

Dytiscus.



Dermestes.

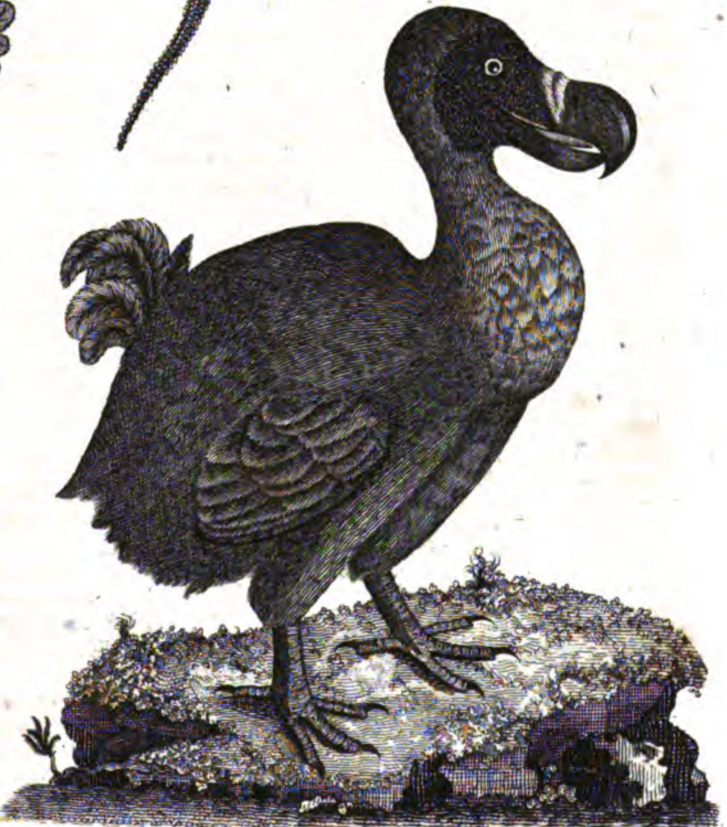
Draco Volans.



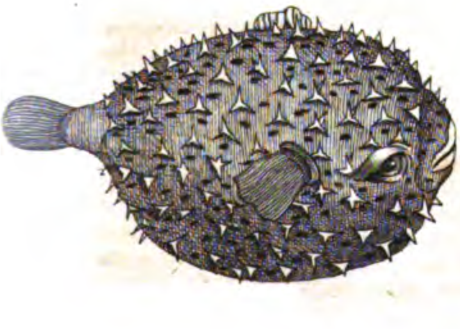
Donax.

Doris.

Dodo.



Diodon.



A.Bell Prin.Wal.Sculptor fecit.

2. cap. 10. The ordinary cannot viſit a donative, and therefore it is free from procuration, and the incumbent is exempted from attendance at viſitations.

All biſhopricks in ancient time were donative by the king. Again, where a biſhop has the gift of a benefice, it is properly called a *donative*, becauſe he cannot preſent to himſelf.

DONATORY, in Scots law, that perſon to whom the king beſtows his right to any forfeiture that has fallen to the crown.

DONATUS, a ſchiſmatic biſhop of Carthage, founder of the ſect of DONATISTS. His followers ſwore by him, and honoured him like a god. He died about 368.

DONATUS (Ælius), a famous grammarian, lived at Rome in 354. He was one of St Jerome's maſters; and compoſed commentaries on Terence and Virgil, which are eſteemed.

DONAWERT, a ſtrong town of Germany, in the circle of Bavaria on the frontiers of Suabia. It has been taken and retaken ſeveral times in the wars of Germany; and was formerly an imperial city, but at preſent is ſubject to the duke of Bavaria. E. Long. 10. 32. N. Lat. 48. 32.

DONAX, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the oyſter kind; and the ſhell has two valves, with a very obtuſe margin in the fore-part. There are 10 ſpecies, principally diſtinguiſhed by the figure of their ſhells.*

* Plate CLXIV.

DONCASTER, a market-town of Yorkſhire, 30 miles ſouth of York. It was noted for knitting worſted ſtockings; that article of their trade is now on the decline.— Doncaſter gives the Engliſh title of Earl to the duke of Buccleugh in Scotland, which belonged to his anceſtor the duke of Monmouth, but was omitted out of the forfeiture. W. Long. 1. 0. N. Lat. 53. 30.

DONNE (Dr John), an excellent poet and divine of the 17th century. His parents were of the Romiſh religion, and uſed their utmoſt efforts to keep him firm to it; but his early examination of the controverſy between the church of Rome and the Proteſtants, at laſt determined him to chooſe the latter. He travelled into Italy and Spain; where he made many uſeful obſervations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great ſeal, appointed him his ſecretary; in which poſt he continued five years. He marrying privately Anne the daughter of Sir George Moore then chancellor of the garter, and niece to the lord keeper's lady, was diſmiſſed from his place, and thrown into priſon. But he was reconciled to Sir George by the good offices of Sir Francis Wolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility ſolicited the king for ſome ſecular employment for him. But his majeſty, who took pleaſure in his converſation, had engaged him in writing his *Pſeudo Martyr*, printed at London in 1610; and was ſo highly pleaſed with that work, that in 1614 he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of Doctor of Divinity from the univerſity of Oxford. In 1619, he attended the earl of Doncaſter in his embaſſy into Germany. In 1621, he was made dean of St Paul's; and the vicarage of St Dunſtan in the weſt, in London, ſoon after fell to him; the advowſon of it having been given to him long before by Richard earl of Dorſet. By theſe and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good proviſion for his children. He wrote, beſides the above, 1. Devotions upon emergent occaſions. 2. The Ancient Hiſtory of the Septuagint, tranſlated from the Greek of Ariſteus, quarto. 3. Three volumes of ſermons, folio. 4. A conſiderable number of poems; and other works. He died in 1631; and was interred in St Paul's cathedral, where a monument was erected to his memory. His writings ſhow him to be a man of incomparable wit and learning; but his greateſt excellence was ſatire. He had a prodigious richneſs of fancy, but his thoughts were much debaſed by his verſification. He was, however, highly celebrated by all the great men of that age.

DONOR, in law, the perſon who gives lands or tenements to another in tail, &c.; as he to whom ſuch lands, &c. are given, is the *donee*.

DOOMSDAY BOOK. See DOMESDAY *Book*.

DOOR, in architecture. See ARCHITECTURE, n° 76.

DOR, the Engliſh name of the common black beetle. Some apply it alſo to the duſty beetle, that flies about hedges in the evening. See SCARABÆUS.

DORADO, in aſtronomy, a ſouthern conſtellation, not viſible in our latitude; it is alſo called *xiphias*. The ſtars of this conſtellation, in Sharp's Catalogue, are ſix.

DORCHESTER, the capital of Dorſetſhire, ſituated on the river Froom, ſix miles north of Weymouth: W. Long. 2. 35. N. Lat. 50. 40. It gives the title of marquis to the noble family of Pierpoint, duke of Kingſton; and ſends two members to parliament.

DOREE, or JOHN DOREE, in ichthyology. See ZEUS.

DORIA (Andrew), a gallant Genoeſe ſea-officer, born in 1466. He entered into the ſervice of Francis I. of France; but preſerved that ſpirit of independence ſo natural to a ſailor and a republican. When the French attempted to render Savona, long the object of jealouſy to Genoa, its rival in trade, Doria remonſtrated againſt the meaſure in a high tone; which bold action, repreſented by the malice of his courtiers in the moſt odious light, irritated Francis to that degree, that he ordered his admiral Barbeſieux to ſail to Genoa, then in the hands of the French troops, to arreſt Doria, and to ſeize his galleys. This raſh order Doria got timely hints of; retired with all his galleys to a place of ſafety; and, while his reſentment was thus raiſed, he cloſed with the offers of the emperor Charles V. returned his commiſſion with the collar of St Michael to Francis, and hoiſted the Imperial colours. To deliver his country, weary alike of the French and Imeprial yoke, from the dominion of foreigners, was now Doria's higheſt ambition; and the favourable moment offered. Genoa was afflicted with the peſtilence, the French garriſon was greatly reduced and ill-paid, and the inhabitants were ſufficiently diſpoſed to ſecond his views. He ſailed to the harbour with 13 galleys, landed 500 men, and made himſelf maſter of the gates and the palace with very little reſiſtance. The French governor with his feeble garriſon retired to the citadel, but was quickly forced to capitulate; when the people ran together, and levelled the citadel with the ground. It was now in Doria's power to have rendered himſelf the ſovereign of his country; but, with a magnanimity of which there are few examples, he aſſembled the people in the court before the palace, diſclaimed all pre-eminence, and recommended to them to ſettle that form of government they choſe to eſtabliſh. The people, animated by his ſpirit, forgot their factions, and fixed that form of government which has ſubſiſted ever ſince with little variation. This event happened in 1528. Doria lived to a great age, reſpected and beloved as a private citizen; and is ſtill celebrated in Genoa by the moſt honourable of all appellations, "The father of his country, and the reſtorer of its liberty."

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnaſſus. See DORIS.

DORIC, in architecture, is the ſecond of the five orders; being that between the Tuſcan and Ionic. It is uſually placed upon the Attic baſe, though originally it had no baſe. See ARCHITECTURE, n° 43.

At its firſt invention it was more ſimple than at preſent; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was reſtrained to this richer manner, and the primitive ſimple manner they called by a new name, the Tuſcan order, which was chiefly uſed in temples; as the former, being more light and delicate, was for porticos and theatres. The tradition is, that Dorus, king of Achaia, having firſt built a temple of this order at Argos, which he dedicated to Juno, occaſioned it to be called *Doric;* though others derive its name, from its being invented or uſed by the Dorians.

The moderns, on account of its ſolidity, uſe it in large ſtrong buildings; as in the gates of cities and citadels, the outſides of churches, and other maſſy works, where delicacy of ornaments would be unſuitable. The gate of Burlington-houſe in Piccadilly is of the Doric order.

The moſt conſiderable antient monuments of this order, are the theatre of Marcellus at Rome; wherein the capital, the height of the frize, and its projecture, are much ſmaller than in the modern architecture; and the Parthenion, or temple of Minerva at Athens, in which the ſhort and maſſy columns bear upon the pavement without a baſe; and the capital is a ſimple torus, with its cincture, and a ſquare, plain, and ſolid abacus.

DORIC Cymatium. See CYMA.

DORIC Dialect, one of the five dialects, or manners of ſpeaking, which obtained among the Greeks.

It was firſt uſed by the Lacedemonians, and particularly thoſe of Argos; thence it paſſed into Epirus, Libya, Sicily, the iſlands of Rhodes, and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuſe; as likewiſe Pindar.

In ſtrictneſs, however, we ſhould rather define Doric, the manner of ſpeaking peculiar to the Dorians, after their receſs near Parnaſſus and Aſopus; and which afterwards came to obtain among the Lacedemonian, &c. Some even diſtinguiſh between the Lacedemonian and Doric; but, in reality, they were the ſame; ſetting aſide a few particularities in the language of the Lacedemonians; as is ſhown by Rulandus, in his excellent treatiſe *De Lingua Græca ejuſque Dialectis*, lib. v.

Beſide the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypſelas, Alcman, and Sophron.

Moſt of the medals of the cities of Græcia Magna, and Sicily, ſavour of the Doric dialect in their inſcription: witneſs, ΑΜΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΤΑΝ, ΗΡΑΧΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΑΝ, ΚΑΥΛΟΝΙΑΤΑΝ, ΚΟΠΙΑΤΑΝ, ΤΑΥΡΟΜΕΝΙΤΑΝ, &c. Which ſhows the countries wherein the Doric dialect was uſed.

The general rules of this dialect are thus given by the Port-royaliſts.

D'ι Ητα, d'ω grand, d'ε, do & d'υ l'α fait le Dore.
D'ει fait ητα; d'υ, ω; & d'ω αυ fait encore.
Oſte ι de l'infini: & pour le ſingulier
Se ſert au femenin du nombre plurier.

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Theſſaly.

The *a* abounds every where in the Doric; but this dialect bears ſo near a conformity with the Æolic, that many reckon them but one.

DORIC Mode, in muſic, the firſt of the authentic modes of the ancients. Its character is to be ſevere, tempered with gravity and joy; and is proper upon religious occaſions, as alſo to be uſed in war. It begins *D, la, ſol, re.* Plato admires the muſic of the Doric mode, and judges it proper to preſerve good manners as being maſculine; and on this account allows it in his commonwealth. The ancients had likewiſe their ſubdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and ſolemn: it began with *re,* a fourth lower than the doric.

DORING, or DARING, among ſportſmen, a term uſed to expreſs a method of taking larks, by means of a clap-net and a looking-glaſs. For this ſport there muſt be provided four ſticks very ſtraight and light, about the bigneſs of a pike; two of theſe are to be four feet nine inches long, and all notched at the edges or the ends. At one end of each of theſe ſticks there is to be faſtened another of about a foot long on one ſide; and on the other ſide a ſmall wooden peg about three inches long. Then four or more ſticks are to be prepared, each of one foot length; and each of theſe muſt have a cord of nine feet long faſtened to it at the end. Every one ſhould have a buckle for the commodious faſtening on to the reſpective ſticks when the net is to be ſpread.—A cord muſt alſo be provided, which muſt have two branches. The one muſt have nine feet and a half, and the other ten feet long, with a buckle at the end of each; the reſt, or body of the cord, muſt be 24 yards long. All theſe cords, as well the long ones as thoſe about the ſticks, muſt be well twiſted and of the bigneſs of one's little finger. The next thing to be provided is a ſtaff of four feet long, pointed at one end, and with a ball of wood at the other, for the carrying theſe conveniences in a ſack or wallet.—There ſhould alſo be carried, on this occaſion, a ſpade to level the ground where there may be any little irregularities; and two ſmall rods, each 18 inches long, and having a ſmall rod fixed with a pack-thread at the larger end of the other. To theſe are to be tied ſome pack-thread loops, which are to faſten in the legs of ſome larks; and there are to be reels to theſe, that the birds may fly a little way up and down. When all this is done, the looking-glaſs is to be prepared in the following manner. Take a piece of wood about an inch and an half thick, and cut it in form of a bow, ſo that there may be about nine inches ſpace between the two ends; and let it have its full thickneſs at the bottom, that it may receive into it a falſe piece; in the five corners of which there are to be ſet in five pieces of looking-glaſs. Theſe are ſo fixed, that they may dart their light upwards; and the whole machine is to be ſupported on a moveable pin, with the end of a long line fixed to it, and made in the manner of the children's play-thing of an apple and a plum-ſtone; ſo that the other end of the cord being carried through a hedge, the barely pulling it may ſet the whole machine of the glaſſes a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed *calls*, and the glittering of the looking-glaſſes as they twirl round in the ſun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the perſon behind an opportunity of pulling up the nets, ſo as to meet over the whole, and take every thing that is between them. The places where this ſort of ſporting ſucceeds beſt are open fields remote from any trees and hedges except one by way of ſhelter for the ſportſman: and the wind ſhould always be either in the front or back; for if it blows ſideways, it prevents the playing of the net.

DORIS, a country of Greece, between Phocis, Theſſaly, and Acarnania. It received its name from Dorus the ſon of Deucalion, who made a ſettlement there. It was called *Tetrapolis* from the four cities of Pindus or Dryopis, Erineum, Cytinium, Borium, which it contained. To theſe four ſome add Lilæum and Carphia, and therefore call it *Hexapolis*. The name of Doris has been common to many parts of Greece. The Dorians in the age of Deucalion inhabited Phthiotis, which they exchanged for Hiſtiæotis, in the age of Dorus. From thence they were driven by the Cadmeans, and came to ſettle near the town of Pindus. From thence they paſſed into Dryopis, and afterwards into Peloponneſus. Hercules having re-eſtabliſhed Ægimius king of Phthiotis or Doris, who had been driven from his country by the Lapithæ, the grateful king appointed Hyllus the ſon of his patron to be his ſucceſſor, and the Heraclidæ marched from that part of the country to go to recover Peloponneſus. The Dorians ſent many colonies into different places, which bore the ſame name as their native country. The moſt famous of theſe is in Aſia Minor, of which Halicarnaſſus was once the capital. This part of Aſia Minor was called *Hexapolis*, and afterwards *Pentapolis*.

Doris, a genus of inſects, belonging to the order of vermes teſtacea. The body is oblong, flat beneath; creeping: mouth placed below: vent behind ſurrounded with a fringe: two feelers, retractile. There are ſeveral ſpecies.—The argo, or lemon doris, has an oval body, convex, marked with numerous punctures, of a lemon colour, the vent beſet with elegant ramifications. It inhabits different parts of our ſeas, called about Brighthelmſtone the *ſea-lemon*. See Plate CLXIV.

DORMANT, in heraldry, is uſed for the poſture of a lion, or any other beaſt, lying along in a ſleeping attitude with the head on the fore-paws; by which it is diſtinguiſhed from the *couchant*, where though the beaſt is lying, yet he holds up his head.

DORMER, in architecture, ſignifies a window made in the roof of an houſe, or above the entablature, being raiſed upon the rafters.

DORMITORY, a gallery in convents or religious houſes, divided into ſeveral cells, in which the religious ſleep or lodge.

DORMOUSE, in zoology. See Mus and Sciurus.

DORONICUM, leopard's bane: A genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked, the pappus ſimple; the ſcales of the calyx in a double row, longer than the diſc. The ſeeds of the radius naked without any pappus. There are three ſpecies; of which the only one worthy of notice is the pardalianches, with obtuſe heart-ſhaped leaves. It grows naturally in Hungary, and on the Helvetian mountains; but is frequently preſerved in the Engliſh gardens. It hath thick fleſhy roots, which divide into many knobs or knees, ſending out ſtrong fleſhy fibres which penetrate deep into the ground; from theſe ariſe in the ſpring a cluſter of heart-ſhaped leaves, which are hairy, and ſtand upon footſtalks: between theſe ariſe the flower-ſtalks, which are channelled and hairy, near three feet high, putting out one or two ſmaller ſtalks from the ſide. Each ſtalk is terminated by one large yellow flower. The plant multiplies very faſt by its ſpreading roots; and the ſeeds, if permitted to ſcatter, will produce plants wherever they happen to fall; ſo that it very ſoon becomes a weed in the places where it is once eſtabliſhed. It loves a moiſt ſoil and ſhady ſituation. The roots were formerly uſed in medicine as alexipharmics and purifiers of the blood, but their operation was ſo violent that they are now entirely laid aſide.

DORSAL, an appellation given to whatever belongs to the back. See Dorsum.

DORSET (Thomas Sackville), Lord Buckhurſt. See Sackville.

Dorset (Charles Sackville), Earl of. See Sackville.

DORSETSHIRE, a county of England, bounded on the ſouth by the Engliſh channel, on the north by Somerſetſhire and Wiltſhire, on the eaſt by Hampſhire, and on the weſt by Devonſhire and ſome part of Somerſetſhire. It is between 40 and 50 miles long from eaſt to weſt, and 34 broad from ſouth to north, and contains 34 hundreds, 22 market-towns, and 248 pariſhes. This county enjoys a mild, pleaſant, and wholeſome air, and a deep, rich, and fertile ſoil, finely diverſified. Towards the north it is level, under the high lands that divide it from Somerſetſhire, where there are fine arable grounds that will yield large crops of different kinds of grain. But on the ſouth, from the borders of Hampſhire by the ſea-coaſt, for an extent of almoſt 20 miles in length, and in ſome places four or five in breadth, is an heathy common, which renders this country leſs populous than it otherwiſe would be. From eaſt to weſt run a ridge of hills called the *Downs*, abounding with ſweet and ſhort herbage, which nouriſhes a vaſt number of ſheep equally eſteemed for their fleſh and fleece. The country is alſo very plentifully watered; and in all reſpects ſo well ſuited both for pleaſure and profit, that it was diſtinguiſhed by the Romans above all others. They had more ſtations and ſummer-camps in Dorſetſhire than in any other county. That the Saxons had the ſame regard for it, is evident from the number of palaces they had in it, the ſtately minſters they built, and the expreſs directions they gave that their bodies ſhould be interred in thoſe monuments of their piety. This county yields many and very valuable commodities. The quarries in Purbeck and Portland ſupply ſtones of different qualities, ſuited to various uſes, and in prodigious quantities, together with ſome very rich and beautiful marble. The beſt tobacco-pipe clay in England is alſo found in this county. Madder, hemp, and flax, alſo thrive in many places, grain of all ſorts, &c.

DORSIFEROUS PLANTS, among botaniſts, ſuch as are of the capillary kind, without ſtalks, and which bear their ſeeds on the back-ſide of their leaves.

DORSTENIA, CONTRAYERVA: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The receptacle is common, monophyllous, and carnous; the ſeeds lying ſingly in the carnous ſubſtance. There are four ſpecies, all of them low herbaceous plants, growing in the warm countries of America. The root is uſed in medicine. It is full of knots; an inch or two in length, about half an inch thick; externally of a reddiſh brown colour, and pale within; long, tough, ſlender fibres ſhoot out from all ſides of it, which are generally loaded with ſmall round knots. The root has a peculiar kind of aromatic ſmell, and a ſomewhat aſtringent, warm, bitteriſh taſte, with a light and ſweetiſh kind of acrimony when chewed. The fibres have little taſte or ſmell; the tuberous part therefore ſhould only be choſen.—Contrayerva is one of the mildeſt of thoſe ſubſtances called *alexipharmics*: it is indiſputably a good and uſeful diaphoretic. Its virtues are extracted both by water and rectified ſpirit, and do not ariſe by evaporation with either. The plants cannot be propagated in this country without the greateſt difficulty.

DORSUM, the BACK, in anatomy, comprehends all the poſterior part of the trunk of the body from the neck to the buttocks. See ANATOMY, n° 29, &c.

DORT, or DORDRECHT, a city of Holland, which holds the firſt rank in the aſſembly of the ſtates. It is ſeated in a ſmall iſland formed by the rivers Meuſe, Merue, Rhine, and Linghe. The Meuſe, on which it ſtands, gives it a good harbour, and ſeparates it from the iſlands of Iſſelmonde and Ablas. It is divided from Beyerland by a canal. The harbour is very commodious for the merchandizes which come down the Rhine and the Meuſe, which keep it in a flouriſhing condition. Its ſtrength conſiſts in being ſurrounded with water. Its walls are old, and defended by round towers. It is very rich, and well built with brick, and had formerly the excluſive right of coining money. It is at preſent the ſtaple town for wines, particularly Rheniſh. It was detached from the main land in 1421, on the 17th of November, by a flood occaſioned by the breaking down of the dyke, which overwhelmed 70 villages, and about 100,000 perſons. However, by time and the induſtry of the inhabitants, a great part of the land is recovered. It has two principal canals, namely, the New and Old Haven, by which heavy-loaded veſſels may enter into the city. Over the Old Haven is a large bridge well built with brick.

Dort was almoſt reduced to aſhes in the year 1457; there being then conſumed 2000 houſes, with the halls, hoſpital, and church of Notre Dame: but they are now well provided with fire-engines and watchmen to prevent the like diſaſter. This city is famous for the meeting of the clergy called the *Senate of Dort*, in which the Calviniſts obtained a ſentence againſt the Arminians, who were called the *Remonſtrants*. The diſpute between the contending parties occaſioned ſtrange diſorders, ſkirmiſhes, and murders, in moſt of the principal cities. Thoſe miniſters who would not ſubſcribe to the decree of the ſynod were baniſhed, of whom there were above 100. E. Long. 4. 36. N. Lat. 51. 39.

Synod of DORT, a national ſynod, ſummoned by authority of the States General, the provinces of Holland, Utrecht, and Overyſſel excepted, and held at Dort in 1618. The moſt eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Heſſia, and the Palatinate, aſſembled on this occaſion in order to decide the controverſy between the Gomariſts or Calviniſts and Arminians; the latter of whom were declared corrupters of the true religion. But the authority of this ſynod was far from being univerſally acknowledged either in Holland or in England. The provinces of Frieſland, Zealand, Utrecht, Guelderland, and Groningen, could not be perſuaded to adopt their deciſions; and they were oppoſed by the authority of Archbiſhop Laud and King James I. in England. The reformed churches in France, though at firſt diſpoſed to give a favourable reception to the deciſions of this famous ſynod, in proceſs of time eſpouſed doctrines very different from thoſe of the Gomariſts; and the churches of Brandenburgh and Bremen would not ſuffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment with reſpect to the doctrines of predeſtination and grace, which the ſpirit that prevailed among the divines of Dort ſeemed ſo much adapted to diſcourage and ſuppreſs, acquired new vigour in conſequence of the arbitrary proceedings of this aſſembly.

DORTMUND, a rich, populous, and imperial city of Germany, in the circle of Weſtphalia. It is pretty large, but not well built. Formerly it was one of the Hanſe towns. Its territory alſo was formerly a county, and had lords of its own; but ſince 1504, it hath been poſſeſſed entirely by the city.

DORYPHORI (from δορυ *ſpear*, and φερω *I bear*), an appellation given to the life-guard-men of the Roman emperors. They were held in ſuch high eſtimation, as frequently to have the command of armies conferred on them.—It was uſual alſo for chief commanders to have their doryphori or life-guard to attend them.

DOSE, in pharmacy, &c. the quantity of a medicine to be taken at one time. The word is formed from the Greek δόσις, which ſignifies *gift*, or a thing given; from δίδωμι *do*, "I give."

DOSITHEANS, Dosithei, an ancient ſect among the Samaritans in the firſt century of the Chriſtian era.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Doſitheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St Jerom, in his dialogue againſt the Luciferians, places him before our Saviour; wherein he is followed by Druſius, who in his anſwer to Serrarius places him about the time of Sennacherib king of Aſſyria. But Scaliger will have him poſterior to our Saviour's time: And in effect Origen intimates him to have been contemporary with the apoſtles; where he obſerves, that he endeavoured to perſuade the Samaritans that he was the Meſſiah foretold by Moſes.

He had many followers; and his ſect was ſtill ſubſiſting at Alexandria in the time of the patriarch Eulogius, as appears from a decree of that patriarch publiſhed by Photius. In that decree, Eulogius accuſes Doſitheus of injuriouſly treating the ancient patriarchs and prophets, and attributing to himſelf the ſpirit of prophecy. He makes him contemporary with Simon Magus; and accuſes him of corrupting the Pentateuch in divers places, and of compoſing ſeveral books directly contrary to the law of God.

Archbiſhop Uſher takes Doſitheus to be the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But all we can juſtly gather from the teſtimony of Eulogius is, that Doſitheus corrupted the Samaritans copies ſince uſed by that ſect; but that corruption did not paſs into all the copies of the Samaritan Pentateuch now in uſe among us, which vary but little from the Jewiſh Pentateuch: And in this ſenſe we are to underſtand that paſſage in a Samaritan chronicle, where it is ſaid that Douſis, *i. e.* Doſitheus, altered ſeveral things in the law of Moſes. The author of that chronicle, who was a Samaritan by religion, adds, that their high-prieſt ſent ſeveral Samaritans to ſeize Douſis and his corrupted copy of the Pentateuch.

Epiphanius takes Doſitheus to have been a Jew by birth, and to have abandoned the Jewiſh party for that of the Samaritans. He imagines him likewiſe to have been the author of the ſect of the Sadducees: Which ſeems inconſiſtent with his being later than our Saviour; and yet the Jeſuit Serrarius agrees to make Doſitheus the maſter of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the ſame Doſitheus, obſerves, that he was the firſt who dared to reject the authority of the prophets by denying their inſpiration. But he charges that as a crime peculiar to this ſectary, which in reality is common to the whole ſect, who have never allowed any but the five books of Moſes for divine.

DOSSER, a ſort of baſket to be carried on the ſhoulders of men. It is uſed in carrying the overplus earth from one part of a fortification to another where it is wanted. There are likewiſe ſmall carts and wheelbarrows for the ſame uſe.

DOSSIL, in ſurgery, is lint made into a cylindric form, or reſembling the ſhape of dates or olive-ſtones. Doſſils are ſometimes ſecured by a thread tied round their middle.

DOTTEREL, in ornithology. See Charadrius.

DOU, or Douw, (Gerard). See Douw.

DOUAY, or Doway, a large and ſtrong city of the French Netherlands, ſituated in E. Long. 3. 0. N. Lat. 50. 25. It is ſituated on the river Scarpe, in a very fertile and pleaſant country. The town is large and populous, and exceedingly well fortified. You enter it by ſix gates, and the ſtreets from each of theſe gates lead to the market-place. Here is a venerable old town-houſe, adorned with the ſtatues of the earls of Flanders, in which the magiſtrates aſſemble, and are renewed every thirteen months. Here alſo are held ſeveral country courts for the dependencies of Douay, which contain about 30 villages. The parliament of Douay was at firſt only a ſupreme council, eſtabliſhed at Tournay in 1668, and erected into a parliament in 1686. But Tournay being taken by the allies in 1709, the parliament was removed to Cambray; and upon the yielding of Tournay to the Auſtrians by the treaty of Utrecht, the parliament was removed to Douay, where it ſtill continues. This city was erected into an univerſity like that of Louvain by Philip II. becauſe of its being in the middle of ſo many great cities, and Louvain at ſo great a diſtance, that the children on that ſide of the country were generally ſent for their education into France. It contains 14 colleges, all governed and ſettled after the manner of thoſe at Louvain; and the ſchools of philoſophy, canon and civil law, and phyſic, are diſpoſed alſo after the ſame manner, only the rector here is choſen annually. There is a conſiderable ſeminary here of Engliſh Roman Catholics, founded by Philip II. of Spain about the year 1569. There is alſo a great number of convents; and among the reſt two Engliſh, one of Franciſcan friars, the other of Benedictine monks. Douay was taken from the Spaniards by the French king in perſon in 1667, after a ſhort reſiſtance. That prince made it very ſtrong, and built a fort about a cannon ſhot below it upon the Scarp, with ſluices, by which the adjacent country could be drowned. The allies laid ſiege to it in 1710, under the command of the Duke of Marlborough; and after a vigorous defence, the town and Fort-Scarp ſurrendered upon honourable terms. It was retaken by the French in 1712, after the ſuſpenſion of arms between Great Britain and France.

DOUBLE; two of a ſort, one correſponding to the other.

Double Children, Double Cats, Double Pears, &c. Inſtances of theſe are frequent in the *Philoſoph. Tranſact.* and elſewhere. See Monster.

Sir John Floyer, in the ſame *Tranſactions*, giving an account of a *double turkey*, furniſhes ſome reflections on the production of *double animals* in general. Two turkeys, he relates, were taken out of an egg of the common ſize, when the reſt were well hatched, which grew together by the fleſh of the breaſt-bone, but in all other parts were diſtinct. They ſeemed leſs than the ordinary ſize, as wanting bulk, nutriment, and room for their growth; which latter, too, was apparently the occaſion of their coheſion. For, having two diſtinct cavities in their bodies, and two hearts, they muſt have ariſen from two cicatriculas; and, conſequently,

quently, the egg had two yolks; which is no uncommon accident. He mentions a dried *double chicken* in his poſſeſſion, which, though it had four legs, four wings, &c. had but one cavity in the body, one heart, and one head; and, conſequently, was produced from one cicatricula.

So, Paræus mentions a *double infant*, with only one heart: in which caſe, the original or ſtamen of the infant was one, and the veſſels regular; only, the nerves and arteries towards the extremities dividing into more branches than ordinary, produced *double* parts.

The ſame is the caſe in the *double flowers* of plants, occaſioned by the richneſs of the ſoil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reaſons of duplicity in embryos: 1. The conjoining or connection of two perfect animals; and, 2. An extraordinary diviſion and ramification of the original veſſels, nerves, arteries, &c.

DOUBLE *Employment*, in muſic, a name given by M. Rameau to the two different manners in which the chord of the ſub-dominant may be regarded and treated, viz. as the fundamental chord of the ſixth ſuperadded, or as the chord of the great ſixth, inverted from a fundamental chord of the ſeventh. In reality, the chords carry exactly the ſame notes, are figured in the ſame manner, are employed upon the ſame chord of the tone, in ſuch a manner, that frequently we cannot diſcern which of the two chords the author employs, but by the aſſiſtance of the ſubſequent chord, which reſolves it, and which is different in theſe different caſes.

To make this diſtinction, we muſt conſider the diatonic progreſs of the two notes which form the fifth and the ſixth, and which, conſtituting between them the interval of a ſecond, muſt one or the other conſtitute the diſſonance of the chord. Now, this progreſs is determined by the motion of the baſs. Of theſe two notes, then, if the ſuperior be the diſſonance, it will riſe by one gradation into the ſubſequent chord, the lower note will keep its place, and the higher note will be a ſuperadded ſixth. If the lower be the diſſonance, it will deſcend into the ſubſequent chord, the higher will remain in its place, and the chord will be that of the great ſixth. See the two caſes of the *double employment* in Rouſſeau's Muſical Dictionary, Plate D, fig. 12.

With reſpect to the compoſer, the uſe which he may make of the double-employment, is to conſider the chord in its different points of view, that from thence he may know how to make his entrance to it, and his exit from it; ſo that having arrived, for inſtance, at the chord of the ſuperadded ſixth, he may reſolve it as a chord of the great ſixth, and reciprocally.

M. D'Alembert has ſhown, that one of the chief uſes of the double-employment is, that we be able to carry the diatonic ſucceſſion of the gamut even to an octave, without changing the mode, at leaſt whilſt we riſe; for in deſcending we muſt change it. Of this gamut and its fundamental baſs, an example will be found in Rouſſeau's Muſical Dictionary, Plate D, fig. 13. It is evident, according to the ſyſtem of M. Rameau, that all the harmonic ſucceſſions which reſult from it, are in the ſame tone: for, in ſtrictneſs, no other chords are there employed but three, that of the tonic, that of the dominant, and that of the ſub-dominant; as this laſt, in the double-employment, conſtitutes the ſeventh from the ſecond note, which is employed upon the ſixth.

With reſpect to what M. D'Alembert adds in his Elements of Muſic, p. 80. and which he repeats in the Encyclopédie, article *Double-emplai*, viz. that the chord of the ſeventh *re fa la ut*, though we ſhould even regard it only as an inverſion of *fa la ut re*, cannot be followed by the chord *ut mi ſol ut*; "I cannot (ſays Rouſſeau) be of his opinion in this point.

"The proof which he gives for it is, that the diſſonance *ut* of the firſt chord cannot be reſolved in the ſecond; and this is true, ſince it remains in its place: but in this chord of the ſeventh *re fa la ut*, inverted from this chord of the ſuperadded ſixth *fa la ut re*, it is not the *ut*, but the *re*, which is the diſſonance; which, of conſequence, ought to be reſolved in aſcending upon *mi*, as it really does in the ſubſequent chord; ſo that this procedure in the baſs itſelf is forced, which, from *re*, cannot without an error return to *ut*, but ought to aſcend to *mi*, in order to reſolve the diſſonance.

"M. D'Alembert afterwards ſhows, that this chord *re fa la ut*, when preceded and followed by that of the tonic, cannot be authoriſed by the double-employment: and this is likewiſe very true; becauſe this chord, tho' figured with a 7, is not treated as a chord of the ſeventh, neither when we make our entrance to it, nor our exit from it; or at leaſt that it is not neceſſary to treat it as ſuch, but ſimply as an inverſion of the ſuperadded ſixth, of which the diſſonance is the baſs: in which caſe we ought by no means to forget, that this diſſonance is never prepared. Thus, though in ſuch a tranſition the double-employment is not in queſtion, though the chord of the ſeventh be no more than apparent, and impoſſible to be reſolved by the rules, this does not hinder the tranſition from being proper and regular, as I have juſt proved to theoriſts., I ſhall immediately prove to practical artiſts, by an inſtance of this tranſition; which certainly will not be condemned by any one of them, nor juſtified by any other fundamental baſs except my own. (See the Muſical Dictionary, Plate D, fig. 14.)

"I acknowledge, that this inverſion of the chord of the ſixth ſuperadded, which transfers the diſſonance to the baſs, has been cenſured by M. Rameau. This author, taking for a fundamental chord the chord of the ſeventh, which reſults from it, rather choſe to make the fundamental baſs deſcend diatonically, and reſolve one ſeventh by another, than to unfold this ſeventh by an inverſion. I had diſſipated this error, and many others, in ſome papers which long ago had paſſed into the hands of M. D'Alembert, when he was compoſing his Elements of Muſic; ſo that it is not his ſentiment which I attack, but my own opinion which I defend."

For what remains, the double-employment cannot be uſed with too much reſerve, and the greateſt maſters are the moſt temperate in putting it in practice.

DOUBLE *Fichy*, or *Fiché*, in heraldry, the denomination of a croſs, when the extremity has two points; in contradiſtinction to fiché, where the extremity is ſharpened away to one point.

DOUBLE *Octave*, in muſic, an interval compoſed of fifteen notes in diatonic progreſſion; and which, for that reaſon, is called a *fifteenth*. "It is (ſays Rouſſeau) an interval compoſed of two octaves, called by the Greeks *diſdiapaſon*."

It deſerves, however, to be remarked, that in intervals leſs diſtant and compounded, as in the *third*, the *fifth*, the

the *ſimple octave*, &c. the loweſt and higheſt extremes are included in the number from whence the interval takes its name. But, in the *double octave*, when termed a fifteenth, the ſimple number of which it is compoſed gives the name. This is by no means analogical, and may occaſion ſome confuſion. We ſhould rather chooſe, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals conſiſt, and call the *double* octave a ſixteenth, according to the general analogy. See INTERVAL.

DOUBLET, among lapidaries, implies a counterfeit ſtone compoſed of two pieces of cryſtal, and ſometimes glaſs ſoftened, together with proper colours between them; ſo that they make the ſame appearance to the eye as if the whole ſubſtance of the cryſtal had been tinged with theſe colours.

The impracticability of imparting tinges to the body of cryſtals, while in their proper and natural ſtate, and the ſoftneſs of glaſs, which renders ornaments made of it greatly inferior in wear to cryſtal, gave inducements to the introduction of colouring the ſurface of cryſtal wrought in a proper form, in ſuch a manner, that the ſurfaces of two pieces ſo coloured being laid together, the effect might appear the ſame as if the whole ſubſtance of the cryſtal had been coloured. The cryſtals, and ſometimes white tranſparent glaſs ſo treated, were called *doublets*; and at one time prevailed greatly in uſe on account of the advantages, with reſpect to wear, ſuch doublets had, when made of cryſtal, over glaſs, and the brightneſs of the colours which could with certainty be given to counterfeit ſtones this way, when coloured glaſs could not be procured, or at leaſt not without a much greater expence. Doublets have not indeed the property which the others have, of bearing to be ſet tranſparent, as is frequently required in drops of ear-rings and other ornaments: but when mounted in rings, or uſed in ſuch manner that the ſides of the pieces, where the joint is made, cannot be inſpected, they have, when formed of cryſtal, the title to a preference to the coloured glaſs; and the art of managing them is therefore, in ſome degree, of the ſame importance with that of preparing glaſs for the counterfeiting gems; and is therefore properly an appendage to it, as being entirely ſubſervient to the ſame intention. The manner of making doublets is as follows:

Let the cryſtal or glaſs be firſt cut by the lapidaries in the manner of a brilliant, except that, in this caſe, the figure muſt be compoſed from two ſeparate ſtones, or parts of ſtones, formed in the manner of the upper and under parts of a brilliant, if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended ſtone are thus cut, and fitted ſo exactly that no diviſion can appear when they are laid together, the upper part muſt be poliſhed ready for ſetting; and then the colour muſt be put betwixt the two plates by this method. "Take of Venice or Cyprus turpentine two ſcruples; and add to it one ſcruple of the grains of maſtich choſen perfectly pure, free from foulneſs, and previouſly powdered. Melt them together in a ſmall ſilver or braſs ſpoon ladle, or other veſſel, and put to them gradually any of the coloured ſubſtances below mentioned, being firſt well powdered; ſtirring them together as the colour is put in, that they may be thoroughly commixed. Warm then the doublets to the ſame degree of heat as the melted mixture; and paint the upper ſurface of the lower part, and put the upper one inſtantly upon it, preſſing them to each other, but taking care that they may be conjoined in the moſt perfectly even manner. When the cement or paint is quite cold and ſet, the redundant part of it, which has been preſſed out of the joint of the two pieces, ſhould be gently ſcraped off the ſide, till there be no appearance of any colour on the outſide of the doublets: and they ſhould then be ſkilfully ſet; obſerving to carry the mounting over the joint, that the upper piece may be well ſecured from ſeparating from the under one."

The colour of the ruby may be beſt imitated, by mixing a fourth part of carmine with ſome of the fineſt crimſon lake that can be procured.

The ſapphire may be counterfeited by very bright Pruſſian blue, mixed with a little of the above mentioned crimſon lake, to give it a caſt of the purple. The Pruſſian blue ſhould not be very deep-coloured, or but little of it ſhould be uſed: for otherwiſe, it will give a black ſhade that will be injurious to the luſtre of the doublets.

The emerald may be well counterfeited by diſtilled verdigreaſe, with a little powdered aloes. But the mixture ſhould not be ſtrongly heated, nor kept long over the fire after the verdigreaſe is added: for the colour is to be ſoon impaired by it.

The reſemblance of the garnet may be made by dragon's blood; which, if it cannot be procured of ſufficient brightneſs, may be helped by a very ſmall quantity of carmine.

The amethyſt may be imitated by the mixture of ſome Pruſſian blue with the crimſon lake; but the proportions can only be regulated by direction, as different parcels of the lake and Pruſſian blue vary extremely in the degree of ſtrength of the colour.

The yellow topazes may be counterfeited by mixing the powdered aloes with a little dragon's blood, or by good Spaniſh anotto: but the colour muſt be very ſparingly uſed, or the tinge will be too ſtrong for the appearance of that ſtone.

The chryſolite, hyacinth, vinegar garnet, eagle marine, and other ſuch weaker or more diluted colours, may be formed in the ſame manner, by leſſening the proportions of the colours, or by compounding them together correſpondently to the hue of the ſtone to be imitated; to which end it is proper to have an original ſtone, or an exact imitation of one, at hand when the mixture is made, in order to the more certain adapting the colours to the effect deſired: and when theſe precautions are taken, and the operation well conducted, it is practicable to bring the doublets to ſo near a reſemblance of the true ſtones, that even the beſt judges cannot diſtinguiſh them, when well ſet, without a peculiar manner of inſpection.

There is, however, an eaſy method of diſtinguiſhing doublets, which is only to behold them betwixt the eye and light, in ſuch poſition, that the light may paſs through the upper part and corners of the ſtone; when it will eaſily be perceived that there is no colour in the body of the ſtone.

DOUBLETS, a game on dice within tables; the men, which are only 15, being placed thus: Upon the ſice, cinque, and quatre points, there ſtand three men a-piece; and upon the trey, duce, and ace, only two. He that throws higheſt hath the benefit of throwing firſt, and what he throws he lays down, and ſo doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down firſt, bears firſt; and will doubtleſs win the game, if the other throws not doublets to overtake him: which he is ſure to do, ſince he advances or bears as many as the doublets make, viz. eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of ſoldiers into one. Thus, when the word of command is, *double your ranks*, the ſecond, fourth, and ſixth ranks march into the firſt, third, and fifth, ſo that the ſix ranks are reduced to three, and the intervals between the ranks become double what they were before.

Doubling, among hunters, who ſay that a hare doubles, when ſhe keeps in plain fields, and winds about to deceive the hounds.

Doubling, in the manege, a term uſed of a horſe, who is ſaid to double his reins, when he leaps ſeveral times together, to throw his rider: thus we ſay, *the ramingue doubles his reins, and makes pontlevis.*

Doubling, in navigation, the act of ſailing round, or paſſing beyond, a cape or promontory, ſo as that the cape or point of land ſeparates the ſhip from her former ſituation, or lies between her and any diſtant obſerver.

Doubling-Upon, in naval tactics, the act of incloſing any part of a hoſtile fleet between two fires, or of cannonading it on both ſides.

It is uſually performed by the van or rear of that fleet which is ſuperior in number, taking the advantage of the wind, or of its ſituation and circumſtances, and tacking or veering round the van or rear of the enemy, who will thereby be expoſed to great danger, and can ſcarcely avoid being thrown into a general confuſion.

DOUBLON, or Dubloon, a Spaniſh and Portugueſe coin, being the double of a Pistole.

DOUBTING, the act of with-holding our aſſent from any propoſition, on ſuſpicion that we are not thoroughly appriſed of the merits thereof, or from not being able peremptorily to decide between the reaſons for and againſt it.

Doubting is diſtinguiſhed by the ſchoolmen into two kinds, *dubitatio ſterilis*, and *dubitatio efficax*. The former is that where no determination enſues: in this manner the Sceptics and Academics doubt, who withhold their aſſent from every thing. See Sceptics, &c.

The latter is followed by judgment, which diſtinguiſhes truth from falſehood: ſuch is the doubting of the Peripatetics and Carteſians. The laſt in particular are perpetually inculcating the deceitfulneſs of our ſenſes, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reaſon. On the other hand, the Epicureans teach, that our ſenſes always tell truth; and that, if you go ever ſo little from them, you come within the province of doubting. See Carteſians, Epicureans, &c.

Doubting, in rhetoric, a figure whereon the orator appears ſome time fluctuating, and undetermined what to do or ſay. Tacitus furniſhes us with an inſtance of doubting, almoſt to a degree of diſtraction, in thoſe words of Tiberius written to the ſenate: *Quid ſcribam, P. S. aut quomodo ſcribam, aut quid omnino non ſcribam hoc tempore, dii me deæque pejus perdant quam perire quotidie ſentio, ſi ſcio.*

DOUCETS, or Doulcets, among ſportſmen, denote the teſtes of a deer or ſtag.

DOUCINE, in architecture, a moulding concave above and convex below, ſerving commonly as a cymatium to a delicate corniche. It is likewiſe called Gula.

DOVE, in ornithology. See Columba.

Dove-Tailing, in carpentry, is the manner of faſtening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the ſtrongeſt of the aſſemblages or jointings; becauſe the tenon, or piece of wood which is put into the other, goes widening to the extreme, ſo that it cannot be drawn out again, by reaſon the extreme or tip is bigger than the hole.

DOVER, a borough and port town of England, in the county of Kent, ſituated in E. Long. 0. 25. N. Lat. 51. 10. It ſends two members to parliament, ſtyled *barons of the Cinque-ports*, whereof Dover is the chief. Dover gave the title of duke in the Queenſberry family, but extinct: now a revived barony in the York family.

By the Romans this town was named *Dubris*, and by the Saxons *Doſra*, probably from the Britiſh word *Dour*, which ſignifies water. The convenience of its ſituation drew the attention of the Roman governors, who ruled here while they poſſeſſed this part of the iſland; and there ſtill remain indubitable teſtimonies of their care and reſpect for this important place. For the defence of the town, the Romans, or, according to ſome, Arviragus, a Britiſh king, their confederate, by cutting out walls with infinite labour in the ſolid rock, conſtructed a ſtony fortreſs; and, as its venerable remains ſtill prove, erected alſo a light-houſe for the benefit of navigation. The Saxons, Danes, and Normans, had a very high opinion of this place; and when the barons invited over the young prince, afterwards Louis VIII. of France, his father Philip Auguſtus conceived a bad opinion of the expedition, becauſe the caſtle and port of Dover were held for king John, though a great part of the kingdom had ſubmitted to Louis. In its moſt flouriſhing ſtate, the fortreſs was impregnable, and the town a very opulent emporium. It had 21 wards, each of which furniſhed a ſhip for the public ſervice, 10 gates, 7 pariſh-churches, many religious houſes, hoſpitals, and other public edifices. The decay of the town was brought on by that of the harbour. To recover this, Henry VIII. ſpent no leſs than 63,000l. in conſtructing piers, and 5000l. in building a caſtle between this and Folkſtone, called *Sandgate;* where the ſhore was flat, and the landing eaſy. Notwithſtanding all this expence, however, it was again choaked up in the reign of queen Elizabeth, by whom it was again cleared at a vaſt expence, ſo that ſhips of ſome hundred tons could enter it. Since that time it has again declined, notwithſtanding of many efforts for its relief, and great aſſiſtance from time to time given by parliament for this purpoſe. As the haven, however, is ſtill capable of receiving veſſels of ſmall burden; and as the packets to France and Flanders are ſtationed here in time of peace, it is ſtill a place of ſome conſequence, and the people are active and induſtrious.

Dover Straits, the narrow channel between Dover and Calais, which ſeparates our iſland from the oppoſite continent. Britain is ſuppoſed by many to have been once peninſulated, the preſent ſtraits occupying the ſite of the iſthmus which joined it to Gaul. "No certain cauſe (ſays Mr Pennant*) can be given for the mighty convulſion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual daſhing of the waters, no Pythagoras is left to ſolve the *Fortuna locorum:*

> *Vidi ego, quod fuerat quondam ſolidiſſima tellus*
> *Eſſe fretum.*

But it is moſt probable, that the great philoſopher alluded to the partial deſtruction of the *Atlantica inſula*, mentioned by Plato as a diſtant tradition in his days. It was effected by an earthquake and a deluge, which might have rent aſunder the narrow iſthmus in queſtion, and left Britain, large as it ſeems at preſent, the mere wreck of its original ſize. The Scilly iſles, the Hebrides, Orkneys, Schetlands, and perhaps the Feroe iſlands, may poſſibly be no more than fragments of the once far-extended region. I have no quarrel about the word *iſland*. The little iſthmus, compared to the whole, might have been a junction never attended to in the limited navigations of very early times. The peninſula had never been wholly explored, and it paſſed with the ancients for a genuine iſland. The correſpondency of ſtrata on part of the oppoſite ſhores of Britain and France, leaves no room to doubt but that they were once united. The chalky cliffs of Blancnez between Calais and Bologne, and thoſe to the weſtward of Dover, exactly tally: the laſt are vaſt and continued; the former ſhort, and the termination of the immenſe bed. Between Bologne and Folkſtone (about ſix miles from the latter) is another memorial of the junction of the two countries; a narrow ſubmarine hill, called the *Rip-raps*, about a quarter of a mile broad, and ten miles long, extending eaſtwards towards the Goodwin Sands. Its materials are boulderſtones, adventitious to many ſtrata. The depth of water on it, in very low ſpring-tides, is only fourteen feet. The fiſhermen from Folkſtone have often touched it with a fifteen feet oar; ſo that it is juſtly the dread of navigators. Many a tall ſhip has periſhed on it, and ſunk inſtantly into twenty-one fathoms water. In July 1782, the Belleiſle of ſixty-four guns ſtruck, and lay on it during three hours; but, by ſtarting her beer and water, got clear off."

Theſe celebrated ſtraits are only twenty-one miles wide in the narroweſt part. From the pier at Dover to that at Calais is twenty-four. It is conjectured, that their breadth leſſens, and that they are two miles narrower than they were in ancient times. An accurate obſerver of fifty years remarks to me, that the increaſed height of water, from a decreaſe of breadth, has been apparent even in that ſpace. The depth of the channel at a medium in higheſt ſpring-tides is about twenty-five fathoms. The bottom either coarſe ſand or rugged ſcars, which have for ages unknown reſiſted the attrition of the currents. From the ſtraits both eaſtward and weſtward is a gradual increaſe of depth through the channel to a hundred fathoms, till ſoundings are totally loſt or unattended to. The ſpring-tides in the ſtraits riſe on an average twenty-four feet, the neap-tides fifteen. The tide flows from the German ſea, paſſes the ſtraits, and meets, with a great rippling, the weſtern tide from the ocean between Fairleigh near Haſtings and Bologne; a proof that, if the ſeparation of the land was effected by the ſeas, it muſt have been by the overpowering weight of thoſe of the north.

Dover, a town of Delaware in North America. It is the chief town of the county of Kent in the Delaware ſtate, and is the ſeat of government. It ſtands on Jones's creek, a few miles from the Delaware river, and conſiſts of about 100 houſes, principally of brick. Four ſtreets interſect each other at right angles, in the centre of the town, whoſe incidencies form a ſpacious parade, on the eaſt ſide of which is an elegant ſtate-houſe of brick. The town has a lively appearance, and drives on a conſiderable trade with Philadelphia. Wheat is the principal article of export. The landing is five or ſix miles from the town of Dover.

DOUGLAS (Lord). See *(Hiſtory of)* SCOTLAND.

Douglas (Gavin), biſhop of Dunkeld in Scotland, was the third ſon of Archibald earl of Angus, and born in the year 1474. Where he was educated, is not known; but it is certain that he ſtudied theology: a ſtudy, however, which did not eſtrange him from the muſes; for he employed himſelf at intervals in tranſlating into beautiful verſe the poem of Ovid *de Remedio Amoris*. The advantages of foreign travel, and the converſation of the moſt learned men in France and Germany, to whom his merit procured the readieſt acceſs, completed his education. With his ſuperior recommendations and worth it was impoſſible he could remain unnoticed. His firſt preferment was to be provoſt of the collegiate church of St Giles in Edinburgh; a place at that time of great dignity and revenue. In the year 1514, the queen mother, then regent of Scotland, appointed Douglas abbot of Aberbrothock, and ſoon after archbiſhop of St Andrew's; but the queen's power not being ſufficient to eſtabliſh him in the poſſeſſion of that dignity, he relinquiſhed his claim in favour of his competitor Foreman, who was ſupported by the pope. In 1515, he was by the queen appointed biſhop of Dunkeld; and that appointment was ſoon after confirmed by his holineſs Leo X. Nevertheleſs it was ſome time before he could obtain peaceable poſſeſſion of his ſee. The duke of Albany, who in this year was declared regent, oppoſed him becauſe he was ſupported by the queen; and, in order to deprive him of his biſhopric, accuſed him of acting contrary to law in receiving bulls from Rome. On this accuſation he was committed to the caſtle of Edinburgh, where he continued in confinement above a year; but the regent and the queen being at laſt reconciled, he obtained his liberty, and was conſecrated biſhop of Dunkeld. In 1517, he attended the duke of Albany to France; but returned ſoon after to Scotland. In 1521, the diſputes between the earls of Arran and Angus having thrown the kingdom into violent commotion, our prelate retired to England, where he became intimately acquainted with Polydore Virgil the hiſtorian. He died in London of the plague in 1522; and was buried in the Savoy. He wrote, 1. The Palace of Honour: a moſt ingenious poem under the ſimilitude of a viſion; in which he paints the vanity and inconſtancy of all worldly glory. It abounds with incidents, and a very rich vein of poetry. The palace of happineſs, in the picture of Cebes, ſeems to be the ground-work of it. 2. *Aurea Narrationes:* a performance now loſt; in which, it is ſaid, he explained, in a moſt agreeable manner, the mythology of the poetical fictions of the ancients. 3. *Comœdiæ aliquot ſacræ:* None of which are now to be found. 4. Thirteen Bukes of Eneades, of the famoſe poet Virgil, tranſlatet out of Latin verſes into Scottiſh metre, every buke having its particular prologe. Imprinted at London 1553, in 4to; and reprinted at Edinburgh 1710, in folio. The laſt is the moſt eſteemed of all his works. He undertook it at the deſire of lord Henry Sinclair, a munificent patron of arts in thoſe times: and he completed it in 18 months; a circumſtance which his admirers are too fond of repeating to his advantage. David Hume of Godſcroft, an author of uncommon merit, and an admirable judge of poetry, gives the following teſtimony in his favour. "He wrote (ſays he) in his native tongue divers things; but his chiefeſt work is his tranſlation of Virgil, yet extant, in verſe: in which he ties himſelf ſo ſtrictly as is poſſible; and yet it is ſo well expreſſed, that whoſoever will eſſay to do the like, will find it a hard piece of work to go through with it. In his prologues before every book, where he hath his liberty, he ſhoweth a natural and ample vein of poetry, ſo pure, pleaſant, and judicious, that I believe there is none that hath written before or ſince but cometh ſhort of him." It has been ſaid, that he compiled an hiſtorical treatiſe *De rebus Scoticis;* but no remain of it hath deſcended to the preſent times.

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* Arct. Zool. Vol. I. Introd. p. ii.

Douglas, the principal town of the Iſle of Man, and which has lately increaſed both in trade and buildings. The harbour, for ſhips of a tolerable burden, is the ſafeſt in the iſland, and is much mended by a fine mole that has been built. It is ſeated on the eaſtern ſide. W. Long. 4. 25. N. Lat. 54. 7.

DOUW (Gerhard), a celebrated painter, was born at Leyden in 1613; and received his firſt inſtructions in drawing and deſign from Bartholomew Dolendo an engraver, and alſo from Peter Kouwhoorn a painter on glaſs; but at the age of fifteen he became a diſciple of Rembrandt. In that famous ſchool he continued for three years; and then found himſelf qualified to ſtudy nature, the moſt unerring director.

From Rembrandt he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-ſcuro; but to that knowledge he added a delicacy of pencil, and a patience in working up his colours to the higheſt degree of neatneſs, ſuperior to any other maſter. He therefore was more pleaſed with thoſe pictures of Rembrandt which were painted in his youth than thoſe by which he was diſtinguiſhed in his more advanced age; becauſe the firſt ſeemed finiſhed with more care and attention, the latter with more boldneſs, freedom, and negligence, which was quite oppoſite to the taſte of Douw. But although his manner appears ſo different from that of his maſter, yet it was to Rembrandt alone that he owed all that excellence in colouring by which he triumphed over all the artiſts of his own country.

His pictures uſually are of a ſmall ſize, with figures ſo exquiſitely touched, ſo tranſparent, ſo wonderfully delicate, as to excite aſtoniſhment as well as pleaſure. He deſigned every object after nature, and with an exactneſs ſo ſingular, that each object appears as perfect as nature itſelf, in reſpect to colour, freſhneſs, and force. His general manner of painting portraits was by the aid of a concave mirror, and ſometimes by looking at the object through a frame with many exact ſquares of fine ſilk. But the latter cuſtom is diſuſed, as the eye of a good artiſt ſeems a more competent rule, though the uſe of the former is ſtill practiſed by painters in miniature.

It is almoſt incredible what vaſt ſums have been given and are given at this day for the pictures of Douw, even in his own country; as alſo in Italy and every polite part of Europe: for he was exceedingly curious in finiſhing them, and patiently aſſiduous beyond example. Of that patience Sandrart gives a ſtrong proof in a circumſtance which he mentions relative to this artiſt. He ſays, that having once, in company with Bamboccio, viſited Gerhard Douw, they could not forbear to admire the prodigious neatneſs of a picture which he was then painting, in which they took particular notice of a broom; and expreſſing their ſurpriſe at the exceſſive neatneſs of the finiſhing that minute object, Douw told them he ſhould ſpend three days more in working on that broom before he ſhould account it entirely complete. In a family picture of Mrs Spiering, the ſame author ſays, that the lady had ſat five days for the finiſhing one of her hands that leaned on an arm-chair. For that reaſon not many would ſit to him for their portraits; and he therefore indulged himſelf moſtly in works of fancy, in which he could introduce objects of ſtill life, and employ as much time on them as ſuited his own inclination. Houbraken teſtifies, that his great patron Mr Spiering allowed him a thouſand guilders a-year, and paid beſide whatever he demanded for his pictures, and purchaſed ſome of them for their weight in ſilver; but Sandrart, with more probability, aſſures us, that the thouſand guilders a-year were paid to Gerhard, on no other conſideration than that the artiſt ſhould give his benefactor the option of every picture he painted, for which he was immediately to receive the utmoſt of his demand. This great maſter died in 1674, aged 61.

Douw appears inconteſtably to be the moſt wonderful in his finiſhing of all the Flemiſh maſters. Every thing that came from his pencil is precious, and his colouring hath exactly the true and the lovely tints of nature; nor do his colours appear tortured, nor is their vigour leſſened by his patient pencil; for whatever pains he may have taken, there is no look of labour or ſtiffneſs; and his pictures are remarkable, not only for retaining their original luſtre, but for having the ſame beautiful effect at a proper diſtance as they have when brought to the neareſt view.

At Turin are ſeveral pictures by Gerhard Douw, wonderfully beautiful; eſpecially one, of a Doctor attending a ſick woman, and ſurveying an urinal. The execution of that painting is aſtoniſhingly fine, and although the ſhadows appear a little too dark, the whole has an inexpreſſible effect. In the gallery at Florence there is a night-piece by candle-light, which is exquiſitely finiſhed; and in the ſame apartment, a mountebank attended by a number of figures, which it ſeems impoſſible either ſufficiently to commend or to deſcribe.

DOULEIA, δουλεια, among the Athenians, a kind of puniſhment, by which the criminal was reduced into the condition of a ſlave. It was never inflicted upon any but the ατιμοι, *ſojourners* and *freed ſervants.*

To DOUSE, in ſea language, is to lower ſuddenly, or ſlacken; and it is applied to a ſail in a ſquall of wind, an extended hawſer, &c.

DOWAGER, Dotissa (*q. d.* a widow endowed, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and perſons of high rank only.

Queen Dowager, is the widow of the king, and as ſuch enjoys moſt of the privileges belonging to her as queen conſort: but it is not high treaſon to violate her chaſtity or conſpire her death, becauſe the ſucceſſion is not endangered thereby; but no man can marry her without ſpecial licenſe from the king, on pain of forfeiting his lands and goods. See Queen.

DOWER, (*Dotarium, Doarium,* or *Dos,*) a portion of lands or tenements which a widow enjoys for term of life from her huſband, in caſe ſhe ſurvives him: and which, at her death, deſcends to their children. But ſhe muſt have been the wife of the party at the time of his deceaſe; or not divorced *a vinculo matrimonii:* nor, if ſhe has eloped from her huſband, and lives with an adulterer, ſhall ſhe be intitled to dower, unleſs her huſband be voluntarily reconciled to her. The widows of traitors are alſo barred of their dower by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unleſs ſhe be queen-conſort. And if a woman levies a fine with her huſband, or if a common recovery be had with the huſband and wife of the huſband's lands, ſhe is barred of her dower. A widow, clear of theſe impediments, is by law intitled to be endowed of all lands and tenements, of which her huſband was ſeiſed in fee-ſimple or fee-tail at any time during the coverture; and of which any iſſue ſhe might have had might by poſſibility have been heir. See Jointure.

DOWN, a county of Ireland in the province of Ulſter, bounded on the eaſt and ſouth by St George's channel; on the weſt by the county of Armagh; and on the north by the county of Antrim. It lies oppoſite to the Iſle of Man, Cumberland, and Weſtmoreland; and the north part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it. It is about 44 miles in length and 30 in breadth. It ſends 14 members to parliament, two for the county, and 12 for the following boroughs, Down-Patrick, Newry, Newtown, Killeleagh, Bangor, and Hillſborough.

This county is rough and full of hills, and yet the air is temperate and healthy. The ſoil naturally produces wood, unleſs conſtantly kept open and ploughed; and the low grounds degenerate into bogs and moſs, where the drains are neglected. But by the induſtry of the inhabitants it produces good crops of corn, particularly oats; and, where marl is found, barley. This laſt is exported from Killogh to Dublin. The ſtaple commodity of this county is the linen manufacture.

Down, or *Down-Patrick*, a town of Ireland, in the county of Down, is one of the moſt ancient in that kingdom. It is a market-town and a biſhoprick, ſaid to be erected in the fifth century by St Patrick, but is now united to the ſee of Connor. Within 200 paces of the town, on the aſcent of a hill, are the ruins of an old cathedral, remarkable for the tomb of St Patrick the founder, in which they ſay the bodies of St Bridget and St Columb are alſo laid. The town, which is ſeated on the ſouth corner of Lough Coin, now called the *lake of Strangford*, is adorned with ſeveral handſome public buildings. Among the hills, and in many iſlands, are flights of ſwans and other water-fowl; and the Lough abounds with ſalmon, mullets, and other ſea-fiſh. About a mile from this town is St Patrick's well, which many people frequent to drink at ſome ſeaſons of the year, and others to perform a penance enjoined them by the popiſh prieſts. The linen manufacture is carried on here, as it is in ſeveral places in this country. W. Long. 5. 50. N. Lat. 54. 23.

Down, the fine feathers from the breaſts of ſeveral birds, particularly of the duck kind.—That of the eider-duck (ſee Anas, n° 17.) is the moſt valuable. Theſe birds pluck it from their breaſts and line their neſts with it. We are told that the quantity of down found in one neſt more than filled the crown of an hat, yet weighed no more than three quarters of an ounce. Br. Zool.—Three pounds of this down may be compreſſed into a ſpace ſcarce bigger than one's fiſt; yet is afterwards ſo dilatable as to fill a quilt five feet ſquare. Salern. Orn. p. 416.—That found in the neſts is moſt valued, and termed *live down;* it is infinitely more elaſtic than that plucked from the dead bird, which is little eſteemed in Iceland. The beſt ſort is ſold at 45 fiſh *per* pound when cleanſed, and at 16 when not cleanſed. There are generally exported every year, on the company's account, fifteen hundred or two thouſand pounds of both ſorts, excluſive of what is privately exported by foreigners. In 1750 the Iceland Company ſold as much in quantity of this article as amounted to three thouſand ſeven hundred and forty-five banco-dollars, beſides what was ſent directly to Gluckſtadt.—Von Troil. p. 146.

Down or hair of plants. See Hair.

DOWNETON, or Duneton, a borough-town of Wiltſhire, five miles ſouth of Saliſbury. It ſends two members to parliament.

DOWNHAM, a market-town of Norfolk, 10 miles ſouth of Lynn, famous for its good butter; there being 1000, and ſometimes 2000, firkins bought here every Monday, and ſent up the river Ouſe to Cambridge, from whence it is conveyed to London in the Cambridge-waggons.

DOWNS, a bank or elevation of ſand, which the ſea gathers and forms along its ſhores; and which ſerves it as a barrier. The word is formed from the French *dune*, of the Celtic *dun*, a "mountain." Charles de Viſch. in his *Compend. Chronolog. Exord. & Progreſſ. Abbat. Clariſſ. B. Mariæ, de Dunis*, ſays, *Vallem reperit arenarum collibus (quos incolæ* Duynen *vocant) undique cinctam.*

Downs are particularly uſed for a famous road for ſhips, along the eaſtern coaſt of the county of Kent, from Dover to the North Foreland; where both the outward and homeward-bound ſhips frequently make ſome ſtay; and ſquadrons of men of war rendezvous in time of war.

It affords excellent anchorage; and is defended by the caſtles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her huſband in marriage: it is otherwiſe called *maritagium*, marriage-goods, and differs from dower. See Dower.

DOXOLOGY, an hymn uſed in praiſe of the Almighty, diſtinguiſhed by the title of *greater* and *leſſer*.

The leſſer doxology was anciently only a ſingle ſentence, without reſponſe, running in theſe words, *Glory be to the Father, and to the Son, and to the Holy Ghoſt, world without end, Amen.* Part of the latter clauſe, *As it was in the beginning, is now, and ever ſhall be,* was inſerted ſome time after the firſt compoſition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghoſt.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghoſt.* This difference of expreſſion occaſioned no diſputes in the church, till the riſe of the Arian hereſy; but when the followers of Arius began to make uſe of the latter as a diſtinguiſhing character of their party, it was entirely laid aſide by the Catholics, and the uſe of it was enough to bring any one under ſuſpicion of heterodoxy.

The doxology was uſed at the cloſe of every ſolemn office. The weſtern church repeated it at the end of every pſalm, and the eaſtern church at the end of the laſt pſalm. Many of their prayers were alſo concluded with it, particularly the ſolemn thankſgiving or conſecration prayer at the euchariſt. It was alſo the ordinary concluſion of their ſermons.

The greater doxology, or angelic hymn, was likewiſe of great note in the ancient church. It began with theſe words, which the angels ſung at our Saviour's birth, *Glory be to God on high, &c.* It was chiefly uſed in communion ſervice, and in mens private devotions. Both the doxologies have a place in the church of England, the former being repeated after every pſalm, and the latter uſed in the communion ſervice.

DRABA, in botany: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ.* The ſilicula is entire, and oval oblong; with the valves a little plane, parallel to the partition: there is no ſtyle. There are ſix ſpecies; of which the only one worthy of notice is the verna, or early whitlow-graſs. It hath naked ſtalks, with leaves a little ſerrated. The bloſſoms are white, and at night the flowers hang down. It grows on old walls and dry banks. It is one of the earlieſt flowering plants we have, and is good to eat as a ſalad. Goats, ſheep, and horſes eat it; cows are not fond of it; ſwine refuſe it.

DRABLER, in the ſea-language, a ſmall ſail in a ſhip, which is the ſame to a bonnet that a bonnet is to a courſe, and is only uſed when the courſe and bonnet are too ſhoal to clothe the maſt. See Bonnet and Course.

DRABLING, in angling, is a method of catching barbels. Take a ſtrong line of ſix yards; which, before you faſten it to your rod, muſt be put through a piece of lead, that if the fiſh bite, it may ſlip to and fro, and that the water may ſomething move it on the ground; bait with a lobe worm well ſecured, and ſo by its motion the barbel will be enticed into the danger without ſuſpicion. The beſt places are in running water near piles, or under wooden bridges, ſupported with oaks floated and ſlimy.

DRABS, in the ſalt-works, a kind of wooden boxes for holding the ſalt when taken out of the boiling pan; the bottoms of which are made ſhelving or inclining forwards, that the briny moiſture of the ſalt may drain off.

DRAC, an imaginary being, much dreaded by the country people in many parts of France. The dracs are ſuppoſed to be malicious or at leaſt trickſome demons; but, which is very rare, if one of them happens to take a fancy to a man or woman, they are ſure to be the better for it. They are ſtill ſaid to lay gold cups and rings on the ſurface over pits and rivers, as baits to draw women and children in; though their uſual dwelling is ſome old empty houſe, whence they make excurſions in human form, viſible or inviſible as beſt ſuits their purpoſe. The country folks ſhudder at the very name of the drac. Some are poſitive that they have ſeen him; for happy indeed is that village in which there is not a houſe execrated as the lurking-place of this tremendous drac.

DRACÆNA, in botany; a genus of the monogynia order, belonging to the hexandria claſs of plants. The corolla is ſexpartite and erect; the filaments a little thicker about the middle; the berry trilocular and monoſpermous.

DRACHM, a Grecian coin, of the value of ſevenpence three farthings. Drachm is alſo a weight uſed by our phyſicians; containing juſt ſixty grains three ſcruples, or the eighth part of an ounce.

DRACO, a celebrated lawgiver of Athens. When he exerciſed the office of archon, he made a code of laws for the uſe of his citizens, which, on account of their ſeverity, were ſaid to be written in letters of blood. By them idleneſs was puniſhed with as much ſeverity as murder, and death was denounced againſt the one as well as the other. Such a code of rigorous laws gave occaſion to a certain Athenian to aſk of the legiſlator, why he was ſo ſevere in his puniſhments? and Draco gave for anſwer, that as the ſmalleſt tranſgreſſion had appeared to him deſerving death, he could not find any puniſhment more rigorous for more atrocious crimes. Theſe laws were at firſt enforced, but they were often neglected on account of their extreme ſeverity; and Solon totally aboliſhed them, except that one which puniſhed a murderer with death. The popularity of Draco was uncommon, but the gratitude of his admirers proved fatal to him. When once he appeared on the theatre, he was received with repeated applauſe; and the people, according to the cuſtom of the Athenians, ſhowed their reſpect to their lawgiver by throwing garments upon him. This was done in ſuch profuſion, that Draco was ſoon hid under them, and ſmothered by the too great veneration of his citizens. He lived about 624 years before the Chriſtian era.

Draco, the *Dragon*, in zoology, a genus belong-

Plate CLXIV.

ing to the order of amphibia reptilia; the characters of which are theſe: it has four legs, a cylindrical tail, and two membranaceous wings, radiated like the fins of a fiſh, by which he is enabled to fly, but not to any great diſtance at a time. There are two ſpecies. 1. The volans, or flying dragon, with the wings entirely diſtinct from the fore-legs. It is found in Africa and the Eaſt Indies. 2. The præpos, with the wings fixed to the fore-legs. It is a native of America. They are both harmleſs creatures; and feed upon flies, ants, and ſmall inſects.

Draco Volans, in meteorology, a fiery exhalation, frequent in marſhy and cold countries.

It is moſt common in ſummer; and though principally ſeen playing near the banks of rivers, or in boggy places, yet ſometimes mounts up to a conſiderable height in the air, to the no ſmall terror of the amazed beholders; its appearance being that of an oblong, ſometimes roundiſh, fiery body, with a long tail. It is entirely harmleſs, frequently ſticking to the hands and cloaths of people without injuring them in the leaſt.

Draco, in aſtronomy, a conſtellation of the northern hemiſphere; whoſe ſtars, according to Ptolemy, are 81; according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33; and according to Mr Flamſteed, 80. See Astronomy, n° 406.

DRACOCEPHALUM, DRAGON'S HEAD; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants. The throat of the corolla is inflated, the upper lip concave. There are 13 ſpecies, moſt of them herbaceous, annual, or perennial plants, from 18 inches to three feet high, garniſhed moſtly with entire leaves, and whorled ſpikes of ſmall monopetalous and ringent flowers of a blue, white, or purple colour. They are all eaſily propagated by ſeeds, which may be ſown either in the ſpring or autumn; and after the plants are come up they will require no other culture but to be kept clear from weeds.

DRACONARIUS, in antiquity, DRAGON-BEARER. Several nations, as the Perſians, Parthians, Scythians, &c. bore dragons on their ſtandards; whence the ſtandards themſelves were called *dracones*, "dragons." The Romans borrowed the ſame cuſtom from the Parthians; or, as Caſaubon has it, from the Dacæ; or, as Codin, from the Aſſyrians.

The Roman dracones were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus: but among the Perſians and Parthians they were like the Roman eagles, figures in full relievo; ſo that the Romans were frequently deceived, and took them for real dragons.

The ſoldier who bore the dragon or ſtandard was called by the Romans *draconarius;* and by the Greeks δρακοναριος and δρακοντειοφορος; for the emperors carried the cuſtom with them to Conſtantinople.

DRACONTIC MONTH, the time of one revolution of the moon from her aſcending node, called *caput draconis*, to her return thither.

DRACONTIUM, DRAGONS: A genus of the polyandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the firſt order, *Palmæ*. The ſpatha is cymbiform, or ſhaped like a boat; the ſpadix covered all over; there is no calyx; there are five petals; the berries polyſpermous. There are five ſpecies, all natives of the Indies. The only one which makes any appearance is the pertuſum; with leaves having holes, and a climbing ſtalk. This is a native of moſt of the Weſt India iſlands. It hath trailing ſtalks which put out roots at every joint, that faſten to the trunks of trees, walls, or any ſupport which is near them, and thereby riſe to the height of 25 or 30 feet. The leaves are placed alternately upon long footſtalks: they are four or five inches long, two and an half broad; and have ſeveral oblong holes in each, which at firſt ſight appears as if eaten by inſects, but they are natural to the leaves. The flowers are produced at the top of the ſtalk, which always ſwells to a much larger ſize in that part than in any other: theſe are covered with an oblong ſpatha or hood of a whitiſh green colour, which opens longitudinally on one ſide, and ſhows the piſtil, which is cloſely covered with flowers of a pale yellow, inclining to white. This plant is eaſily propagated by cuttings; which if planted in pots filled with poor ſandy earth, and plunged into a hot-bed, will ſoon put out roots; but the plants are ſo tender, that they muſt be preſerved in a ſtove.

DRACUNCULI, in medicine, ſmall long worms which breed in the muſcular parts of the arms and legs, called *Guinea worms*. The common way of getting out theſe worms is by the point of a needle; and to prevent their forming there again, the uſual cuſtom is to waſh the parts with wine or vinegar, with alum, nitre, or common ſalt, or with a ſtrong lixivium of oak-aſhes, and afterwards anointing them with an ointment of the common kind uſed for ſcorbutic eruptions, with a ſmall mixture of quickſilver.

DRACUNCULUS, in botany. See Arum.

DRAFF, a name given in ſome places to the waſh given to hogs, and the grains given to cows.

DRAG, in building. A door is ſaid to *drag* when in opening or ſhutting it hangs or grates upon the floor.

Drag, in ſea-language, is a machine conſiſting of a ſharp, ſquare, iron ring, encircled with a net, and commonly uſed to take the wheel off from the platform or bottom of the decks.

DRAGOMAN, or Drogman, a term of general uſe through the Eaſt for an interpreter, whoſe office is to facilitate commerce between the orientals and occidentals. Theſe are kept by the ambaſſadors of Chriſtian nations reſiding at the Porte for this purpoſe.

The word is formed from the Arabic *targeman* or *targiman*, of the verb *taragem*, "he has interpreted." From *dragoman* the Italians formed *dragomano*, and, with a nearer relation to its Arabic etymology, *turcimanno;* whence the French and our *trucheman*, as well as *dragoman* and *drogman*.

DRAGON, in aſtronomy. See Draco.

Dragon's Head and Tail (caput & cauda draconis), are the nodes of the planets; or the two points wherein the ecliptic is interſected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes. One of theſe points looks northward; the moon beginning then to have northward latitude, and the other ſouthward, where ſhe commences ſouth. Thus her deviation from the ecliptic ſeems (according to the fancy of ſome) to make a figure like to that of a dragon, whoſe belly is where ſhe has the greateſt latitude; the interſection repreſenting the head and tail, from which reſemblance the denomination ariſes.

But note, that theſe points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wiſe 3 minutes 11 ſeconds *per* day; completing their circle in 18 years 225 days: ſo that the moon can be but twice in the ecliptic during her monthly period, but at all other times ſhe will have a latitude or declination from the ecliptic.

It is about theſe points of interſection that all eclipſes happen. They are uſually denoted by theſe characters ☊ dragon's head, and ☋ dragon's tail.

Dragon, in zoology. See Draco.

Dragon's Blood, a gummi-reſinous ſubſtance brought from the Eaſt Indies, either in oval drops wrapped up in flag leaves, or in large maſſes compoſed of ſmaller tears. It is ſaid to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and ſeveral other vegetables.

The writers on the materia medica in general give the preference to the former, though the others are not unfrequently of equal goodneſs. The fine dragon's blood of either ſort breaks ſmooth, free from any viſible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimſon. Several artificial compoſitions, coloured with the true dragon's blood, or Brazil wood, are ſometimes ſold in the room of this commodity. Some of theſe diſſolve like gums in water; others crackle in the fire without proving inflammable; whilſt the genuine ſanguis draconis readily melts and catches flame, and is not acted on by watery liquors. It totally diſſolves in pure ſpirit, and tinges a large quantity of the menſtruum of a deep red colour. It is likewiſe ſoluble in expreſſed oils, and gives them a red hue, leſs beautiful than that communicated by anchuſa. This drug in ſubſtance has no ſenſible ſmell or taſte; when diſſolved, it diſcovers ſome degree of warmth and pungency. It is uſually, but without foundation, looked upon as a gentle aſtringent; and ſometimes directed as ſuch in extemporaneous preſcription againſt ſeminal gleets, the fluor albus, and other fluxes. In theſe caſes, it is ſuppoſed to produce the general effects of reſinous bodies, lightly incraſſating the fluids, and ſomewhat ſtrengthening the ſolids. But in the preſent practice it is very little uſed either externally or internally.

A ſolution of dragon's blood in ſpirit of wine is uſed for ſtaining marble, to which it gives a red tinge, which penetrates more or leſs deeply according to the heat of the marble during the time of application. But as it ſpreads at the ſame time that it ſinks deep, for fine deſigns the marble ſhould be cold. Mr du Fay ſays, that by adding pitch to this ſolution the colour may be rendered deeper.

Dragon-Fiſh, or *Dragonet*, in ichthyology. See Callionymus.

Dragon-Fly. See Libellula.

Dragon-Shell, in natural hiſtory, a name given by people curious in ſhells to a ſpecies of concamerated patella or limpet. This has a top very much bent; and is of an aſh-colour on the outſide, but of an elegant and bright fleſh-colour within. This has been found ſticking on the back of a tortoiſe, as the common limpets do on the ſides of rocks; and ſome have been found affixed to large ſhells of the pinna marina brought from the Eaſt Indies at different times.

Dragons, in botany. See Dracontium.

DRAGONET, or *Dragon-Fiſh*, in ichthyology. See Callionymus.

DRAGONNE'E, in heraldry. A lion dragonnée is where the upper half reſembles a lion, the other half going off like the hinder part of a dragon. The ſame may be ſaid of any other beaſt as well as a lion.

DRAGOON, in military affairs, a muſqueteer mounted on horſeback, who ſometimes fights or marches on foot, as occaſion requires.

Menage derives the word *dragoon* from the Latin *draconarius*, which in Vegetius is uſed to ſignify *ſoldier*. But it is more probably derived from the German *tragen* or *dragen*, which ſignifies *to carry*; as being infantry carried on horſeback.

Dragoons are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-maſter, two ſerjeants, three corporals, and two drums. Some regiments have hautboys. They are very uſeful on any expedition that requires diſpatch; for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the paſſes leading to the camp; and ſometimes they are brought to cover the general's quarters: they march in the front and rear of the army.

The firſt regiment of dragoons raiſed in England was in 1681, and called the regiment of dragoons of North Britain. In battle or attacks they generally fight ſword in hand after the firſt fire. Their arms are, a ſword, firelock, and bayonet. In the French ſervice, when the dragoons march on foot, their officers bear the pike and the ſerjeants the halbert, neither of which are uſed in the Engliſh ſervice.

DRAGOONING, one of the methods uſed by Papiſts for converting refractory heretics, and bringing them within the pale of the true church.

The following method of dragooning the French Proteſtants, after the revocation of the edict of Nantes, under Louis XIV. is taken from a French piece, tranſlated in 1686.

The troopers, ſoldiers, and dragoons went into the Proteſtants houſes, where they marred and defaced their houſehold ſtuff, broke their looking-glaſſes, and other utenſils and ornaments, let their wine run about their cellars, and threw about their corn and ſpoiled it. And as to thoſe things which they could not deſtroy in this manner, ſuch as furniture of beds, linen, wearing apparel, plate, &c. they carried them to the market-place, and ſold them to the Jeſuits and other Roman catholics. By theſe means the Proteſtants in Montaubon alone were, in four or five days, ſtripped of above a million of money. But this was not the worſt.

They turned the dining-rooms of gentlemen into ſtables for their horſes: and treated the owners of the houſes where they quartered with the higheſt indignity and cruelty, laſhing them about from one to another, day and night, without intermiſſion, not ſuffering them to eat or drink; and when they began to ſink under the fatigue and pains they had undergone, they laid them on a bed, and when they thought them ſomewhat recovered, made them riſe, and repeated the ſame tortures. When they ſaw the blood and ſweat run down their faces and other parts of their bodies, they ſluiced them with water, and putting over their heads kettle-drums, turned upſide down, they made a continual din upon them till theſe unhappy creatures loſt their ſenſes. When one party of theſe tormentors were weary, they were relieved by another, who practiſed the ſame cruelties with freſh vigour.

At Negrepliſſe, a town near Montaubon, they hung up Iſaac Favin, a Proteſtant citizen of that place, by his arm-pits, and tormented him a whole night, by pinching and tearing off his fleſh with pinchers. They made a great fire round a boy of about 12 years old, who, with hands and eyes lifted up to heaven, cried out, "My God, help me!" And when they found the youth reſolved to die rather than renounce his religion, they ſnatched him from the fire juſt as he was on the point of being burnt.

In ſeveral places the ſoldiers applied red-hot irons to the hands and feet of men and breaſts of women. At Nantes they hung up ſeveral women and maids by their feet, and others by their arm-pits, and thus expoſed them to public view ſtark naked. They bound to poſts mothers that gave ſuck, and let their ſucking infants lie languiſhing in their ſight for ſeveral days and nights, crying, mourning, and gaſping for life. Some they bound before a great fire, and being half roaſted, let them go; a puniſhment worſe than death. Amidſt a thouſand hideous cries and a thouſand blaſphemies, they hung up men and women by the hair, and ſome by their feet, on hooks in chimnies, and ſmoaked them with wiſps of wet hay till they were ſuffocated. They tied ſome under the arms with ropes, and plunged them again and again into wells; they bound others like criminals, put them to the torture, and with a funnel filled them with wine till the fumes of it took away their reaſon, when they made them ſay, they conſented to be catholics. They ſtripped them naked, and after a thouſand indignities, ſtuck them with pins and needles from head to foot. They cut and ſlaſhed them with knives; and ſometimes with red-hot pinchers took hold of them by the noſe and other parts of the body, and dragged them about the rooms till they made them promiſe to be catholics, or till the cries of theſe miſerable wretches, calling upon God for help, forced them to let them go. They beat them with ſtaves, and thus bruiſed, and with broken bones, dragged them to church, where their forced preſence was taken for an abjuration. In ſome places they tied fathers and huſbands to their bed-poſts, and before their eyes raviſhed their wives and daughters with impunity. They blew up men and women with bellows till they burſt them. If any to eſcape theſe barbarities endeavoured to ſave themſelves by flight, they purſued them into the fields and woods, where they ſhot at them like wild beaſts, and prohibited them from departing the kingdom (a cruelty never practiſed by Nero or Diocleſian) upon pain of confiſcation of effects, the galleys, the laſh, and perpetual impriſonment; inſomuch that the priſons of the ſea-port towns were crammed with men, women, and children, who endeavoured to ſave themſelves by flight from their dreadful perſecution. With theſe ſcenes of deſolation and horror, the popiſh clergy feaſted their eyes, and made them only a matter of laughter and ſport.

Though my heart akes (ſays the writer of the piece from which we are tranſcribing) whilſt I am relating theſe barbarities, yet for a perpetual memorial of the infernal cruelty practiſed by theſe monſters, I beg the reader's patience to lay before him two other inſtances, which, if he hath a heart like mine, he will not be able to read without watering theſe ſheets with his tears.

"The firſt is of a young woman, who being brought before the council, upon refuſing to abjure her religion, was ordered to priſon. There they ſhaved her head, ſinged off the hair from other parts of her body; and having ſtripped her ſtark naked, led her through the ſtreets of the city, where many a blow was given her, and ſtones flung at her: then they ſet her up to the neck in a tub full of water, where, after ſhe had been for a while, they took her out, and put on her a ſhift dipt in wine, which, as it dried and ſtuck to her ſore and bruiſed body, they ſnatched off again, and then had another ready dipped in wine to clap on her. This they repeated ſix times, thereby making her body exceeding raw and ſore. When all theſe cruelties could not ſhake her conſtancy, they faſtened her by her feet in a kind of gibbet, and let her hang in that poſture, with her head downward, till ſhe expired.

"The other is of a man in whoſe houſe were quartered ſome of theſe miſſionary dragoons. One day, having drank plentifully of his wine, and broken their glaſſes at every health, they filled the floor with the fragments, and by often walking over them reduced them to very ſmall pieces. This done, in the inſolence of their mirth, they reſolved on a dance, and told their Proteſtant hoſt that he muſt be one of their company; but as he would not be of their religion, he muſt dance quite barefoot; and thus barefoot they drove him about the room, treading on the ſharp points of the broken glaſſes. When he was no longer able to ſtand, they laid him on a bed, and, in a ſhort time, ſtripped him ſtark naked, and rolled him from one end of the room to the other, till every part of his body was full of the fragments of glaſs. After this they dragged him to his bed, and having ſent for a ſurgeon, obliged him to cut out the pieces of glaſs with his inſtruments, thereby putting him to the moſt exquiſite and horrible pains that can poſſibly be conceived.

"Theſe, fellow Proteſtants, were the methods uſed by the moſt Chriſtian king's apoſtolic dragoons to convert his heretical ſubjects to the Roman catholic faith! Theſe, and many other of the like nature, were the torments to which Louis XIV. delivered them over to bring them to his own church! and as popery is unchangeably the ſame, theſe are the tortures prepared for you, if ever that religion ſhould be permitted to become ſettled amongſt you; the conſideration of which made Luther ſay of it, what every man that knows any thing of Chriſtianity muſt agree with him in, 'If you had no other reaſon to go out of the Roman church, this alone would ſuffice, that you ſee and hear, how, contrary to the law of God, they ſhed innocent blood. This ſingle circumſtance ſhall, God willing, ever ſeparate me from the papacy. And if I was now ſubject to it, and could blame nothing in any of their doctrines; yet for this crime of cruelty, I would fly from her communion, as from a den of thieves and murderers.”

DRAGS, in the ſea-language, are whatever hangs over the ſhip in the ſea, as ſhirts, coats, or the like; and boats, when towed, or whatever elſe that after this manner may hinder the ſhip's way when ſhe ſails, are called *drags*.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of 20, 30, nay ſometimes 40 feet wide, carried through the marſhy ground to ſome river or other place capable of diſcharging the water they carry out of the fen-lands.

An effectual method of drawing off the water from ſuch grounds as are hurt by ſprings oozing out upon them (uſually diſtinguiſhed by the name of *wet* or *ſpouting* ground, or *bogs*), has been a deſideratum in agriculture. Mr Anderſon is almoſt the only perſon who hath treated this matter ſcientifically, and his obſervations ſeem to be very rational and well founded. “Springs (ſays he) are formed in the bowels of the earth, by water percolating through the upper ſtrata where that is of a porous texture, which continues to deſcend downwards till it meets with a ſtratum of clay that intercepts it in its courſe; where, being collected in conſiderable quantities, it is forced to ſeek a paſſage through the porous ſtrata of ſand, gravel, or rock, that may be above the clay, following the courſe of theſe ſtrata till they approach the ſurface of the earth, or are interrupted by any obſtacle which occaſions the water to riſe upwards, forming ſprings, bogs, and the other phenomena of this nature; which being variouſly diverſified in different circumſtances, produce that variety of appearances in this reſpect that we often meet with.

Eſſays on Agriculture, Vol. II. p. 119, &c.

“This being the caſe, we may naturally conclude, that an abundant ſpring need never be expected in any country that is covered to a great depth with ſand without any ſtratum of clay to force it upwards, as is the caſe in the ſandy deſerts of Arabia, and the immeaſurable plains of Libya: neither are we to expect abundant ſprings in any ſoil that conſiſts of an uniform bed of clay from the ſurface to a great depth; for it muſt always be in ſome porous ſtratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is ſupported by a ſtratum of clay, or other ſubſtance that is equally impermeable by water. Hence the *rationale* of that rule ſo univerſally eſtabliſhed in digging for wells, that if you begin with ſand or gravel, &c. you need ſeldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to ſand, gravel, or rock.

“It is neceſſary that the farmer ſhould attend to this proceſs of nature with care, as his ſucceſs in draining bogs, and every ſpecies of damp and ſpouting ground, will in a great meaſure depend upon his thorough knowledge of this,—his acuteneſs in perceiving in every caſe the variations that may be occaſioned by particular circumſtances, and his ſkill in varying the plan of his operations according to theſe. As the variety of caſes that may occur in this reſpect is very great, it would be a very tedious taſk to enumerate the whole, and deſcribe the particular method of treating each; I ſhall therefore content myſelf with enumerating a few particular caſes, to ſhow in what manner the principles above eſtabliſhed may be applied to practice.

Plate CLXV.

“Let fig. 1. repreſent a perpendicular ſection of a part of the earth, in which AB is the ſurface of the ground, beneath which are ſeveral ſtrata of porous ſubſtances which allow the water to ſink through them till it reaches the line CD, that is ſuppoſed to repreſent the upper ſurface of a ſolid bed of clay; above which lies a ſtratum of rock, ſand, or gravel. In this caſe, it is plain, that when the water reaches the bed of clay, and can ſink no farther, it muſt be there accumulated into a body; and ſeeking for itſelf a paſſage, it flows along the ſurface of the clay, among the ſand or gravel, from D towards C; till at laſt it iſſues forth, at the opening A, a ſpring of pure water.

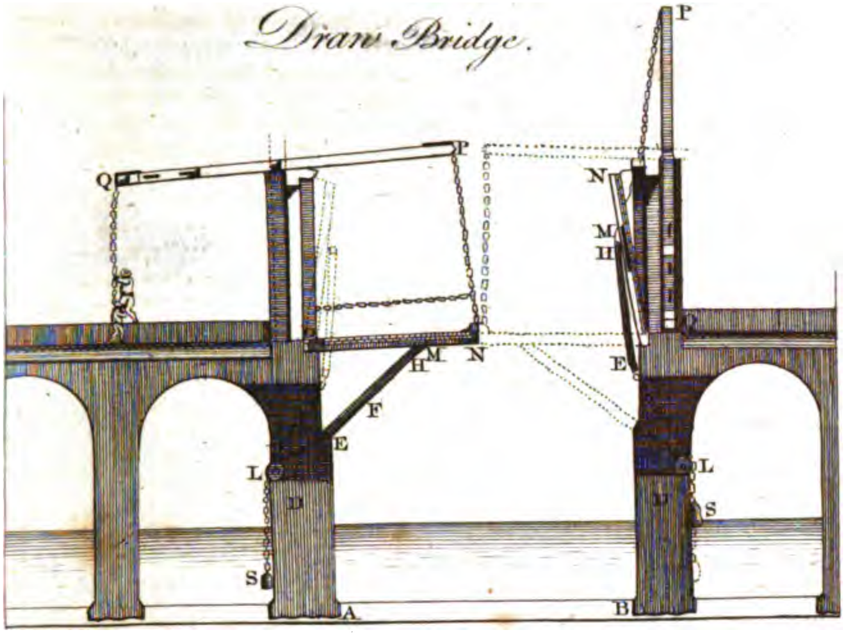
“If the quantity of water that is accumulated between D and C is not very conſiderable, and the ſtratum of clay approaches near the ſurface; in that caſe, the whole of it will iſſue by the opening at A, and the ground will remain dry both above and below it. But, if the quantity of water is ſo great as to raiſe it to a conſiderable height in the bed of ſand or gravel, and if that ſtratum of ſand is not diſcontinued before it reaches the ſurface of the ground, the water, in this caſe, would not only iſſue at A, but would likewiſe ooze out in ſmall ſtreams thro' every part of the ground between A and *a*; forming a barren patch of wet ſandy or gravelly ground upon the ſide of a declivity, which every attentive obſerver muſt have frequently met with.

“To drain a piece of ground in this ſituation is perhaps the moſt unprofitable taſk that a farmer can engage in; not only becauſe it is difficult to execute, but alſo becauſe the ſoil that is gained is but of very little value. However, it is lucky that patches of this kind are ſeldom of great breadth, although they ſometimes run along the ſide of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the higheſt of the ſprings at *a*, which ſhould be of ſuch a depth as not only to penetrate through the whole bed of ſand or gravel, but alſo to ſink ſo far into the bed of clay below, as to make a canal therein ſufficiently large to contain and carry off the whole of the water. Such a ditch is repreſented by the dotted lines *a e z*: but as the expence of making a ditch of ſuch a depth as this would ſuppoſe, and of keeping it afterwards in repair, is very great, it is but in very few caſes that this mode of draining would be adviſeable; and never, unleſs where the declivity happens to be ſo ſmall, as that a great ſurface is loſt for little depth, as would have been the caſe here if the ſurface had extended in the direction of the dotted line *a d*

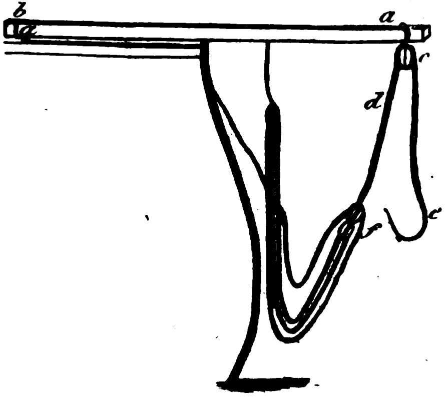
“But ſuppoſing that the ſtratum of clay, after approaching toward the ſurface at A, continued to keep at a little depth below ground; and that the ſoil which lay above it was of a ſandy or ſpungy nature, ſo as to allow the water to penetrate it eaſily; even ſuppoſing the quantity of water that flowed from D to C was but very inconſiderable, inſtead of riſing out at the ſpring A, it would flow forward along the ſurface of the clay among the porous earth that forms the ſoil, ſo as to keep it conſtantly drenched with water, and of conſequence render it of very little value.

Plate CLXV.

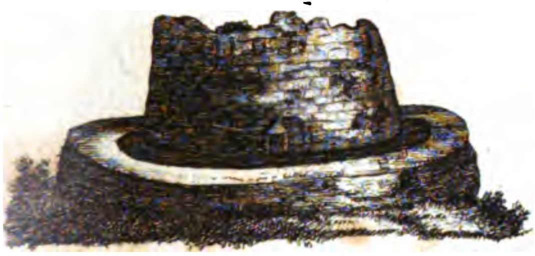
Draw Bridge.



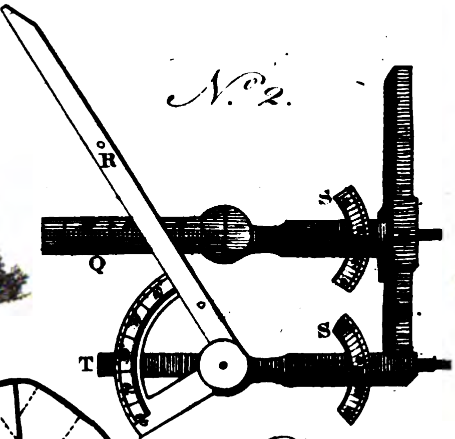
Davit.



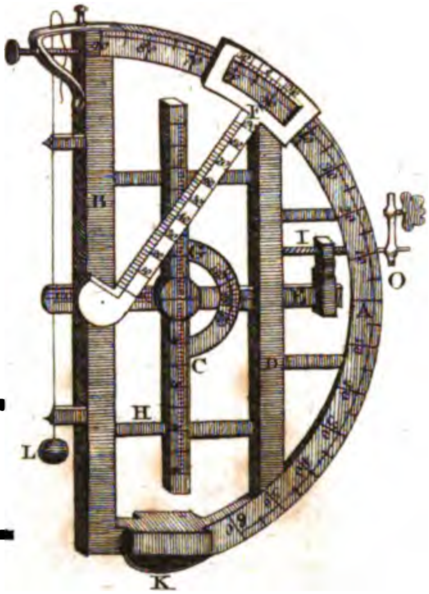
A Dun or Burgh.



N.° 2.



Dendrometer, N.° 1.



Drains.

Fig. 4.

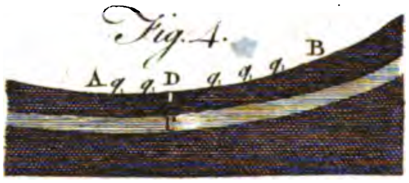


Fig. 5.

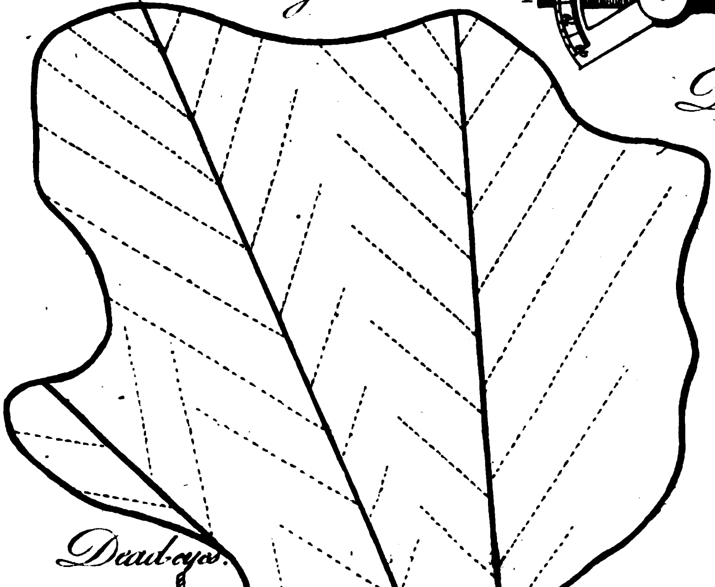


Fig. 3.

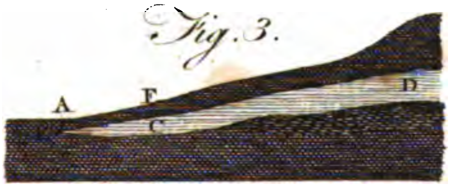
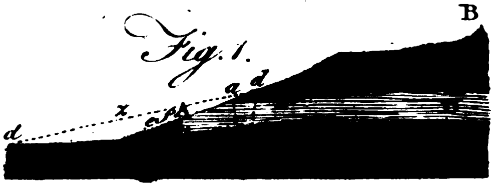


Fig. 1.



Dead-eyes.

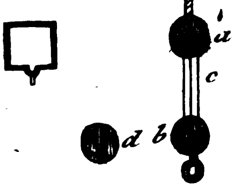
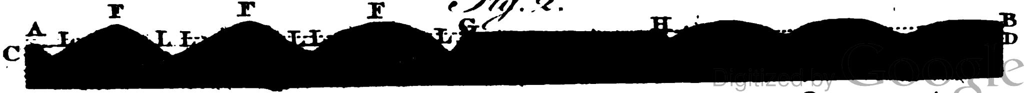


Fig. 2.



A. Bell Prin. Wal. Sculptor fecit.

“Wetneſs ariſing from this cauſe, is uſually of much greater extent than the former: and, as it admits of an eaſy cure, it ought not to be one moment delayed; as a ditch of a very moderate depth opened at A, and carried through a part of the ſtratum of clay (as repreſented by the dotted lines A *kf*), would intercept and carry off the whole of the water, and render the field as dry as could be deſired. It is, therefore, of very great conſequence to the farmer, accurately to diſtinguiſh between theſe two caſes, ſo nearly allied to each other in appearance; and, as this can be eaſieſt done by boring, every one who has much ground of this kind ought to provide himſelf with a ſet of boring-irons, which he will likewiſe find uſe for on other occaſions.

“I might here enumerate a great variety of caſes which might be reduced to the ſame head with the foregoing: but as any attentive reader may, after what has been ſaid, be able eaſily to diſtinguiſh theſe, I ſhall only in general obſerve, that every ſoil of a ſoft and porous texture, that lies upon a bed of hard clay, whatever its ſituation in other reſpects may be, will in ſome meaſure be ſubjected to this diſeaſe. And if it is upon a declivity of any conſiderable length, the undermoſt parts of the field will be much damaged by it, unleſs ditches are thrown up acroſs the declivity at proper diſtances from one another, to intercept the water in its deſcent.

“It may not likewiſe be improper here to obſerve, that in caſes of this nature, unleſs where the ſoil is of a very great depth, the malady will always be increaſed, by raiſing the ridges to a conſiderable height; as will appear evident by examining fig. 2. in which the line A B repreſents the ſurface of a field of this nature, and C D the ſurface of the bed of clay. Now, if this field were raiſed into high ridges, as at F F F, ſo that the furrows E E E deſcended below the ſurface of the clay, it is plain, that all the water that ſhould ſink through the middle of the ridge, would run along the ſurface of the clay till it came to the ſides of the ridge L L L L L L, which would thus be kept continually ſoaked with water. Whereas, if the ground had been kept level, as in the part of the field from G to H, with open furrows H, at moderate diſtances from each other, the water would immediately ſink to the clay, and be carried off by the furrows, ſo as to damage the ſoil far leſs than when the ridges are high. If the ſoil is ſo thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from G to H: but if there is a little greater depth of ſoil, then it ought to be raiſed into ridges of a moderate height, as from H to B, ſo as to allow the bottom of the furrow to reach the clay: but neither is this neceſſary where the ſoil is of any conſiderable depth.

“I have ſeen ſome induſtrious farmers, who having ground in this ſituation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly underſtood the nature of the diſeaſe, they never would have thought of applying ſuch a remedy; as muſt appear evident at firſt ſight to thoſe who examine the figure. The ſucceſs was what might be expected from ſuch a fooliſh undertaking.

“Theſe obſervations, it is hoped, will be ſufficient as to the manner of treating wet, ſandy, or porous ſoils. I now proceed to take notice of ſuch as are of a ſtiff clayey nature, which are often very different in appearance, and require a different treatment from theſe.

Plate CLXV.

“Suppoſe that (in fig. 3.) the ſtratum of ſand or gravel D C ſhould be diſcontinued, as at E, and that the ſtratum above it ſhould be of a coherent clayey nature. In this caſe, the water that flowed towards E, being there pent in on every ſide, and being accumulated there in great quantities, it muſt at length force a paſſage for itſelf in ſome way; and preſſing ſtrongly upon the upper ſurface, if any one part is weaker than the reſt, it there would burſt forth and form a ſpring, (as ſuppoſe at A). But if the texture of every part of this ſtratum were equally ſtrong, the water would ſqueeze thro' many ſmall crannies, and would ooze out in numberleſs places, as between A and F, ſo as to occaſion that kind of wetneſs that is known by the name of a *ſpouting clayey ſoil*.

“The cure, in this caſe, is much more eaſily effected than in any of the former; for if a ditch of a conſiderable ſize is opened, as at A, towards the lowermoſt ſide of the ſpouting ground, ſo deep as to penetrate through the upper ſtratum of clay, and reach to the gravel, the water will riſe up through it at firſt with very great violence, which will gradually decreaſe as the preſſure from the water behind is diminiſhed; and when the whole of the water accumulated in this ſubterraneous reſervoir is run off, there being no longer any preſſure upon the clay above it, the whole ſoon becomes as dry as could be deſired, and continues ſo ever afterwards, if the ditch is always kept open. This I ſpeak from experience, I having rendered ſome fields of this kind that were very wet, quite dry by this method of treating them.

“It will hardly be neceſſary for me here to put the farmer upon his guard, to be particularly careful in his obſervations, that he may diſtinguiſh between the wetneſs that is produced from this cauſe, and that which proceeds from the cauſe before mentioned; becauſe the treatment that would cure the one would be of no uſe at all to the other. The attentive obſerver likewiſe will readily perceive, that if any field that is wet from this cauſe admits of being ploughed, it will be in equal danger of being hurt by being raiſed into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reſervoir would be ſmaller in the deep furrows than any where elſe, there would, of conſequence, be leſs reſiſtance to the water in that place, ſo that it would ariſe there in greater abundance. And if, in this caſe, a farmer ſhould dig a drain in each furrow, as a conſiderable quantity of water would riſe into them, in ſome caſes, the ground might be improved, or even quite drained thereby, eſpecially if they ſhould have accidentally reached the gravel in any one place; although at an expence much greater than was neceſſary. I take notice of this circumſtance in ſome meaſure to prevent the prejudice that ſome inattentive obſervers might entertain againſt what was ſaid before of this method of draining, from their having accidentally ſeen ſome fields that may have been bettered by it.

“Bogs are only a variety of this laſt-mentioned kind of wet ground; and, therefore, ought in general to be drained after the ſame manner with them. Clay is a ſubſtance that ſtrongly reſiſts the entrance of water into it: but when it is long drenched with it, it is, in proceſs of time, in ſome meaſure diſſolved thereby; loſes its original firmneſs of texture and conſiſtence; and becomes a ſort of ſemi-fluid maſs, which is called a *bog;* and as theſe are ſometimes covered with a ſtrong ſcurf of a particular kind of graſs, with very matted roots, which is ſtrong enough to bear a ſmall weight without breaking, although it yields very much, it is in theſe circumſtances called a *ſwaggle*. But, whatever be the nature of the bog, it is invariably occaſioned by water being forced up through a bed of clay, as juſt now deſcribed, and diſſolving or ſoftening, if you will, a part thereof. I ſay only a part; becauſe whatever may be the depth of the bog or ſwaggle, it generally has a partition of ſolid clay between it and the reſervoir of water under it, from whence it originally proceeds: for if this were not the caſe, and the quantity of water were conſiderable, it would meet with no ſufficient reſiſtance from the bog, and would iſſue through it with violence, and carry the whole ſemi-fluid maſs along with it. But this would more inevitably be the caſe, if there was a cruſt at the bottom of the bog, and if that cruſt ſhould ever be broken, eſpecially if the quantity of water under it were very conſiderable: and as it is probable, that, in many caſes of this ſort, the water ſlowly diſſolves more and more of this under-cruſt, I make no doubt, but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the hiſtory of them tranſmitted to poſterity. Of this kind, although formed of a different ſubſtance, I conſider the flow of the Solway-moſs in Northumberland to have been; which, upon the 16th of November 1771, burſt its former boundaries, and poured forth a prodigious ſtream of ſemi-fluid matter, which in a ſhort time covered ſeveral hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moſs,—who knows its reſemblance to clay in its quality of abſorbing and retaining water, and its very eaſy diffuſibility therein, be ſurpriſed at this; as, from all theſe properties, it is much better adapted for forming an extenſive bog, and therefore in greater danger of producing an extenſive devaſtation by an eruption of the water into it, than thoſe that are formed of any kind of clay whatever.

If the bog, or ſwampy ground, is upon a declivity, the ditch ought to be carried acroſs the field about the place where the loweſt ſprings ariſe. But if the ſurface of the ground is level or nearly ſo, as between A and B, and the ſprings break out in ſeveral places, *q q q q q q*, ſo as to form ſoft quagmires interſperſed through the whole of the field, it will be of little conſequence in what part the drain is opened; for if it is dug up ſo deep as to allow the water to riſe in it with freedom, it will iſſue through that opening, and the field will be left perfectly dry. Fig. 4.

"But as it may frequently happen that the ſtratum of gravel ſhould be at a conſiderable depth beneath the ſurface of the earth, and as it may be ſometimes even below the level of the place into which the drain muſt be emptied, it might ſometimes be extremely difficult to make a ditch ſo deep as to reach the bed of ſand or gravel. But it is lucky for us that this is not abſolutely neceſſary in the preſent caſe; as a drain of two or three feet deep, as at D, will be equally effectual with one that ſhould go to the gravel. All that is neceſſary in this caſe, is to ſink pits (P) in the courſe of the drain, at a moderate diſtance from one another, which go ſo deep as to reach the gravel; for as the water there meets with no reſiſtance, it readily flows out at theſe openings, and is carried off by the drain without being forced up through the earth; ſo that the ground is left entirely dry ever after.

"I have likewiſe drained ſeveral fields in this way; and as I have generally found the appearances pretty much alike, I ſhall, for the information of the inexperienced reader, give a ſhort account of them.

"If you attempt to make your pit in one of theſe ſoft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for as the ſubſtance of which it is compoſed is ſoft, it will always flow into the hole as faſt as you dig it; on which account I would adviſe, not to attempt to make the pit in the ſwaggle, but as near it in the ſolid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is ſometimes practicable to make a pit in the ſoft bog at the drieſt time of the year. This I have ſometimes practiſed, which gave me an opportunity of obſerving the nature of theſe bogs more perfectly than I otherwiſe would have had. In the trials of this kind that I have made, this ſoft quaggy ground has ſeldom been above three or four feet deep, below which I have always found a ſtratum of hard tough clay uſually mixed with ſtones; and ſo firm, that nothing but a mattock or pick-axe could penetrate it: and as this is comparatively ſo much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in ſearch of. In digging thro' this ſtratum, you will frequently meet with ſmall ſprings oozing out in all directions; ſome of them that might fill the tube of a ſmall quill, and others ſo ſmall as to be ſcarce perceptible: but without regarding theſe, you muſt continue to dig on without intermiſſion till you come to the main body of the reſervoir, if I may ſo call it, that is contained in the rock, gravel, or ſand; which you will generally find from two to four feet below the bottom of the ſwaggle, and which you will be in no danger of miſtaking when you come to it: for, if there has been no opening made before that in the field, as ſoon as you break the cruſt immediately above the gravel or rock, the water burſts forth like a torrent, and on ſome occaſions riſes like a *jet d'eau*, to a conſiderable height above the bottom of the ditch; and continues to flow off with great impetuoſity for ſome time, till the pent-up water being drained off, the violent boiling up begins to ſubſide, and the ſtrength of the current to abate; and, in a ſhort time, it flows gently out like any ordinary ſpring;—allowing it to remain in this ſtate, the quaggy earth begins to ſubſide, and gradually becomes firmer and firmer every day; ſo that, in the ſpace of a few months, thoſe bogs which were formerly ſo ſoft as hardly to ſupport the weight of a ſmall dog, become ſo firm, that oxen and horſes may tread upon them without any danger of ſinking, at the very wetteſt ſeaſon of the year. I have had a field of this nature, that, by having only one ſuch pit as I have now deſcribed opened in it, was entirely drained to the diſtance of above a hundred yards.

yards around it in every direction. But as it is poſſible that the ſtratum in which the water runs may be in ſome places interrupted, it will be in general expedient to make ſeveral of theſe pits, if the field is of great extent; always carrying the drain forward thro' the lowermoſt part of the field, or as near the quag as you conveniently can; and ſinking a pit wherever you may judge it will be moſt neceſſary. But if the ſtratum of gravel is not interrupted, there will be no violent burſt of water at opening any of theſe after the firſt, as I have frequently experienced. To keep theſe wells from cloſing up after they are made, it is always expedient to fill them up with ſmall ſtones immediately after they are made, which ought to riſe to the height of the bottom of the drain.

"I have often imagined that the expence of digging theſe pits might be ſaved by boring a hole through this ſolid ſtratum of clay with a large wimble made on purpoſe; but as I never experienced this, I cannot ſay whether or not it would anſwer the deſired end exactly.

"If the whole field that is to be drained conſiſts of one extenſive bog, it will require a long time before the whole work can be entirely finiſhed, as it will be impoſſible to open a drain through it till one part of it is firſt drained and becomes ſolid ground. In a ſituation of this kind, the undertaker, after having opened a drain to convey the water from the loweſt part of the bog, muſt approach as near to the ſwampy ground as he can, and there make his firſt pit; which will drain off the water from the neareſt parts of the bog. When this has continued open for ſome time, and that part of the bog is become ſo ſolid as to admit of being worked, let him continue the ditch as far forward thro' it as the ſituation it is in will admit of, and there ſink another pit; and proceed gradually forward in the ſame manner; making croſs cuts where neceſſary, till the whole be finiſhed.

"In this manner may any bog or track of ſpouting ground of this nature be rendered dry at a very inconſiderable expence; and as there can be no other method of draining ground of this ſort effectually, I recommend the ſtudy of it to the attention of every diligent farmer who may have occaſion for it. Let him firſt be extremely cautious in examining all the circumſtances of his particular fields, that he may be certain which of the claſſes above enumerated it may be ranked with; and, when he is perfectly ſure of that, he may proceed without fear, being morally certain of ſucceſs.

"There is, however, one kind of damp ground not yet particularly ſpecified, that I have purpoſely omitted taking notice of till this time, as I have never had any opportunity of examining particularly into the nature of it, nor of aſcertaining by experience what is the moſt proper method of treating it.—The ſoil I have now particularly in my eye conſiſts of a deep ſtrong clay that does not vary its nature even on the ſurface, but in as far as manures may have rendered it more friable and tender: the colour uſually inclines to a reddiſh caſt, and, for the moſt part, it is ſituated upon the ſide of ſome declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a conſiderable quantity of ſmall round ſtones. Many ſoils of the ſort now deſcribed, are apt to be continually moiſt and full of water during the winter ſeaſon; but when the dry weather of ſummer ſets in, the moiſture is diminiſhed, and the ſurface becomes hard, and it is rent into many large gaps which allow free admiſſion to the ſun and air, ſo as to ſcorch up almoſt every plant that is ſowed upon it: and as theſe ſoils are uſually in themſelves naturally fertile when drained, it were to be wiſhed that ſome method could be diſcovered that would be leſs expenſive than what is uſually practiſed with regard to ſome ſoils of this kind in Eſſex; where they make covered drains of two and a half feet deep, running diagonally through the whole field, at the diſtance of 20 feet from each other."

Concerning the making of theſe drains we have the following directions in the Georgical Eſſays, by T. B. Bayley, Eſq; of Hope near Mancheſter.—"Firſt make the main drains down the ſlope or fall of the field. When the land is very wet, or has not much fall, there ſhould, in general, be two of theſe to a ſtatute acre; for the ſhorter the narrow drains are, the leſs liable they will be to accidents. The width of the trench for the main drains ſhould be 30 inches at top, but the width at the bottom muſt be regulated by the nature and ſize of the materials intended to be uſed. If the drain is to be made of bricks 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain muſt be 12 inches; but if the common ſale bricks are uſed, then the bottom muſt be proportionably contracted. In both caſes there muſt be an interſtice of one inch between the bottom brick and the ſides of the trench, and the vacuity muſt be filled up with ſtraw, ruſhes, or looſe mould. For the purpoſe of making theſe drains, I order my bricks to be moulded 10 inches long, 4 broad, and 3 thick; which dimenſions always make the beſt drain.

"The method I purſue in conſtructing my main drains is as follows.—When the ground is ſoft and ſpongy, the bottom of the drain is laid with bricks placed acroſs. On theſe, on each ſide, two bricks are laid flat, one upon the other, forming a drain ſix inches high and four broad; which is covered with bricks laid flat. When the bottom of the trench is found to be a firm and ſolid body, as clay or marle, the bottom of the drain does not then require being laid with bricks. In that caſe the ſides are formed by placing one brick edgewiſe, inſtead of two laid flat.

"This latter method is much cheaper, and in ſuch land equally durable with the other. When ſtones are uſed inſtead of bricks, the bottom of the drain ſhould be about eight inches in width. And here it will be proper to remark, that, in all caſes, the bottom of the main drains muſt be ſunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

"The main drains ſhould be kept open till the narrow ones are begun from them, after which they may be finiſhed; but before the earth is returned upon the ſtones or bricks, it will be adviſeable to throw in ſtraw, ruſhes, or bruſh-wood, to increaſe the freedom of the drain.

"The ſmall narrow drains ſhould be cut at the diſtance of 16 or 18 feet from each other; and ſhould fall into the main drain at very acute angles, to prevent any ſtoppage. At the point where they fall in, and eight or ten inches above it, they ſhould be made

Plate CLXV. firm with brick or ſtone. Theſe drains ſhould be 18 inches wide at top, and 16 at bottom."—Fig. 5. repreſents a field with drains laid out according to Mr Bayley's method. The black lines repreſent the main drains, and the dotted lines repreſent the narrow drains communicating with the former from all parts of the field.

DRAKE, in ornithology, the male of the duck kind. See ANAS.

DRAKE (Sir Francis), the renowned Engliſh admiral, was the ſon of Edmund Drake a ſailor, and born near Taviſtock in Devonſhire, in the year 1545. He was brought up at the expence and under the care of Sir John Hawkins, who was his kinſman; and, at the age of 18, was purſer of a ſhip trading to Biſcay. At 20, he made a voyage to Guinea; and, at 22, had the honour to be made captain of the Judith. In that capacity he was in the harbour of St John de Ulloa, in the gulph of Mexico, where he behaved moſt gallantly in the glorious actions under Sir John Hawkins, and returned with him to England with great reputation, though not worth a groat. Upon this he projected a deſign againſt the Spaniards in the Weſt Indies; which he no ſooner publiſhed, than he had volunteers enough ready to accompany him. In 1570, he made his firſt expedition with two ſhips; and the next year with one only, in which he returned ſafe, if not with ſuch advantages as he expected. He made another expedition in 1572, wherein he did the Spaniards ſome miſchief, and gained conſiderable booties. In theſe expeditions he was much aſſiſted by a nation of Indians, who then were, and have been ever ſince, engaged in perpetual wars with the Spaniards. The prince of theſe people was named *Pedro*; to whom Drake preſented a fine cutlaſs from his ſide, which he ſaw the Indian greatly admired. Pedro, in return, gave him four large wedges of gold; which Drake threw into the common ſtock, ſaying, That he thought it but juſt that ſuch as bore the charge of ſo uncertain a voyage on his credit, ſhould ſhare the utmoſt advantage that voyage produced. Then, embarking his men with all the wealth he had obtained, which was very conſiderable, he bore away for England, where he arrived in Auguſt 1573.

His ſucceſs in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the uſe he made of his riches, a ſtill greater. For, fitting out three ſtout frigates at his own expence, he ſailed with them to Ireland; where, under Walter earl of Eſſex, the father of the famous unfortunate earl, he ſerved as a volunteer, and did many glorious actions. After the death of his noble patron, he returned into England; where Sir Chriſtopher Hatton introduced him to her majeſty, and procured him countenance and protection at court. By this means he acquired a capacity of undertaking that grand expedition which will render his name immortal. The firſt thing he propoſed was a voyage into the South Seas through the Straits of Magellan; which was what hitherto no Engliſhman had ever attempted. The project was well received at court: the queen furniſhed him with means; and his own fame quickly drew together a ſufficient force. The fleet with which he ſailed on this extraordinary undertaking, conſiſted only of five veſſels, ſmall when compared with modern ſhips, and no more than 164 able men. He ſailed on the 13th of December 1577; on the 25th fell in with the coaſt of Barbary, and on the 29th with cape Verd. On the 13th of March he paſſed the equinoctial, made the coaſt of Brazil on the 5th of April, and entered the River de la Plata, where he loſt the company of two of his ſhips; but meeting them again, and taking out their proviſions, he turned them adrift. On the 29th of May he entered the port of St Julian's, where he continued two months for the ſake of laying in proviſions: on the 20th of Auguſt he entered the Straits of Magellan, and on the 25th of September paſſed them, having then only his own ſhip. On the 25th of November he came to Machao, which he had appointed for a place of rendezvous in caſe his ſhips ſeparated; but captain Winter, his vice admiral, having repaſſed the Straits, was returned to England. Thence he continued his voyage along the coaſts of Chili and Peru, taking all opportunities of ſeizing Spaniſh ſhips, and attacking them on ſhore, till his men were ſated with plunder; and then, coaſting America to the height of 48 degrees, he endeavoured to find a paſſage that way back into our ſeas, but could not. However, he landed, and called the country *New Albion*, taking poſſeſſion of it in the name and for the uſe of queen Elizabeth; and, having careened his ſhip, ſet ſail from thence, on the 29th of September 1579, for the Moluccas. He is ſuppoſed to have choſen this paſſage round, partly to avoid being attacked by the Spaniards at a diſadvantage, and partly from the lateneſs of the ſeaſon, whence dangerous ſtorms and hurricanes were apprehended. On the 13th of October he fell in with certain iſlands inhabited by the moſt barbarous people he had met with in all his voyage: on the 4th of November he had ſight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the moſt authentic relations of this voyage, to have been a wiſe and polite prince. On the 10th of December he made Celebes; where his ſhip unfortunately ran upon a rock, the 9th of January following; from which, beyond all expectation, and in a manner miraculouſly, they got off, and continued their courſe. On the 16th of March he arrived at Java Major; and from thence he intended to have directed his courſe to Malacca; but found himſelf obliged to alter his purpoſe, and to think of returning home. On the 25th of March 1580, he put this deſign in execution; and on the 15th of June he doubled the Cape of Good Hope, having then on board 57 men, and but three caſks of water. On the 12th of July he paſſed the line, reached the coaſt of Guinea on the 16th, and there watered. On the 11th of September he made the iſland of Tercera; and on the 3d of November entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ſhip; where, after dinner, ſhe conferred on him the order of knighthood, and declared her abſolute approbation of all he had done. She likewiſe gave directions for the preſervation of his ſhip, that it might remain a monument of his own and his country's glory. This celebrated ſhip, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was preſented to the univerſity of Oxford; up-

Drake.

on which the famous Abraham Cowley made the following verſes:

> " To this great ſhip, which round the world has run,
> " And match'd in race the chariot of the ſun;
> " This Pythagorean ſhip (for it may claim,
> " Without preſumption, ſo deſerv'd a name,
> " By knowledge once, and tranſformation now)
> " In her new ſhape this ſacred port allow.
> " Drake and his ſhip could not have wiſh'd, from fate,
> " An happier ſtation, or more bleſs'd eſtate:
> " For, lo! a ſeat of endleſs reſt is given,
> " To her in Oxford, and to him in heaven.
>
> Works, Vol. II.

In the year 1585, he ſailed with a fleet to the Weſt Indies; and took the cities of St Jago, St Domingo, Carthagena, and St Auguſtin. In 1587, he went to Liſbon with a fleet of 30 ſail; and having intelligence of a great fleet aſſembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of ſhipping: which he afterwards merrily called *burning the king of Spain's beard*. In 1588, when the armada from Spain was approaching our coaſts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of this invaſion. This affair happened in the following manner: On the 22d of July, Sir Francis obſerving a great Spaniſh ſhip floating at a diſtance from both fleets, ſent his pinnace to ſummon the commander to yield. Valdez replied, with much Spaniſh ſolemnity, that they were 450 ſtrong; that he himſelf was Don Pedro, and ſtood much upon his honour; and thereupon propounded ſeveral conditions, upon which he was willing to yield. But the vice-admiral replied, That he had no leiſure to parley: but if he thought fit inſtantly to yield, he might; if not, he ſhould ſoon find that Drake was no coward. Pedro, hearing the name of Drake, immediately yielded, and with 46 of his attendants came on board Drake's ſhip. This Don Pedro remained about two years Sir Francis Drake's priſoner in England; and, when he was releaſed, paid him for his own and his captains liberties, a ranſom of 3500l. Drake's ſoldiers were well recompenſed with the plunder of this ſhip; for they found in it 55,000 ducats of gold, which was divided among them.

A little before this formidable Spaniſh armament put to ſea, the ambaſſador of his Catholic majeſty had the confidence to propound to queen Elizabeth, in Latin verſe, the terms upon which ſhe might hope for peace; which, with an Engliſh tranſlation by Dr Fuller, we will inſert in this place, becauſe Drake's expedition to the Weſt Indies makes a part of this meſſage. The verſes are theſe:

> *Te veto ne pergas bello defendere Belgas:*
> *Quæ Dracus eripuit nunc reſtituantur oportet:*
> *Quas pater evertit jubeo te condere cellas:*
> *Religio Papæ fac reſtituatur ad unguem.*
>
> " Theſe to you are our commands,
> " Send no help to th' Netherlands:
> " Of the treaſure took by Drake,
> " Reſtitution you muſt make:
> " And theſe abbeys build anew,
> " Which your father overthrew:
> " If for any peace you hope,
> " In all points reſtore the pope."

Drake. ‖ Drapery.

The queen's extempore return:

> *Ad Græcas, bone rex, fient mandata kalendis.*
>
> " Worthy king, know, this your will
> " At Latter-Lammas we'll fulfil.

In the year 1589, Sir Francis Drake commanded as admiral the fleet ſent to reſtore Don Antonio king of Portugal, the command of the land-forces being given to Sir John Norris: but they were hardly got to ſea, before the commanders differed, and ſo the attempt proved abortive. The war with Spain continuing, a more effectual expedition was undertaken by Sir John Hawkins and Sir Francis Drake, againſt their ſettlements in the Weſt Indies, than had hitherto been made during the whole courſe of it: but the commanders here again not agreeing about the plan, this alſo did not turn out ſo ſucceſsfully as was expected. All difficulties, before theſe two laſt expeditions, had given way to the ſkill and fortune of Sir Francis Drake; which probably was the reaſon why he did not bear theſe diſappointments ſo well as he otherwiſe would have done. A ſtrong ſenſe of them is ſuppoſed to have thrown him into a melancholy, which occaſioned a bloody flux; and of this he died on board his own ſhip, near the town of Nombre de Dios in the Weſt Indies, on the 28th of January 1595-6. His death was lamented by the whole nation, and particularly by his countrymen; who had great reaſon to love him from the circumſtances of his private life, as well as to eſteem him in his public character. He was elected burgeſs for the town of Boſſiney, alias Tintagal, in the county of Cornwall, in the 27th parliament of queen Elizabeth; and for Plymouth in Devonſhire, in the 35th of the ſame reign. This town had very particular obligations to him: for, in the year 1587, he undertook to bring water into it, through the want of which, till then, it had been grievouſly diſtreſſed; and he performed it by conducting thither a ſtream from ſprings at eight miles diſtance, that is to ſay, in a ſtraight line: for in the manner he brought it, the courſe of it runs upwards of 20 miles.

DRAKENBORCH (Arnold), profeſſor of eloquence and hiſtory at Utrecht, made himſelf known by ſeveral works, and particularly by his Notes on Titus Livius and Silius Italicus; his fine editions of which are highly eſteemed.

DRAMA, a poem containing ſome certain action, and repreſenting a true picture of human life, for the delight and improvement of mankind.

The principal ſpecies of the drama are two, comedy and tragedy. Some others there are of leſs note, as paſtoral, ſatire, tragi-comedy, opera, &c. See the article Poetry.

DRAMATIC, an epithet given to pieces written for the ſtage. See Poetry.

DRANK, among farmers, a term uſed to denote wild oats, which never fail to infeſt worn-out lands; ſo that, when ploughed lands run to theſe weeds and thiſtles, the farmer knows it is high time to fallow them, or elſe to ſow them with hay-ſeed, and make paſture of them.

DRAPERY, in ſculpture and painting, ſignifies the repreſentation of the clothing of human figures, and alſo hangings, tapeſtry, curtains, and moſt other things that are not carnations or landſcapes. See PAINTING, CRAYON, DRAWING, and MINIATURE.

DRASTIC, in phyſic, an epithet beſtowed on ſuch medicines as are of preſent efficacy, and potent in operation; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river, which, taking its riſe in the archbiſhopric of Saltzburg, in Germany, runs ſouth-eaſt through Stiria; and continuing its courſe, divides Hungary from Sclavonia, and fall into the Danube at Eſſeck.

DRAUGHT, in medicine. See POTION.

DRAUGHT, in trade, called alſo *cloff* or *clouch*, is a ſmall allowance on weighable goods, made by the king to the importer, or by the ſeller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 ℔ draught for goods weighing no leſs than 1 Cwt. 2 ℔ for goods weighing between 1 and 2 Cwt. 3 ℔ for goods weighing between 2 and 3 Cwt. 4 ℔ from 3 to 10 Cwt. 7 ℔ from 10 to 18 Cwt. 9 ℔ from 18 to 30 or upwards

DRAUGHT is alſo uſed ſometimes for a bill of exchange, and commonly for an order for the payment of any ſum of money due, &c. Then the perſon who gives the order is ſaid to draw upon the other.

DRAUGHT, or, as it is pronounced, DRAFT, in architecture, the figure of an intended building deſcribed on paper; wherein are laid down, by ſcale and compaſs, the ſeveral diviſions and partitions of the apartments, rooms, doors, paſſages, conveniencies, &c. in their due proportion.

It is uſual, and exceedingly convenient, before a building is begun to be raiſed, to have draughts of the ichnography, or ground-plot of each floor or ſtory; as alſo of the form and faſhion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the ſeveral fronts, &c. are taken, and repreſented in the ſame draught, to ſhow the effect of the whole building: this is called a *ſcenography*, or *perſpective*.

DRAUGHT, the depth of a body of water neceſſary to float a ſhip: hence a ſhip is ſaid to draw ſo many feet of water, when ſhe is borne up by a column of water of that particular depth. Thus, if it requires a body of water whoſe depth is equal to 12 feet, to float or buoy up a ſhip on its ſurface, ſhe is ſaid to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the ſtem and ſtern poſt, regularly from the keel upwards.

DRAUGHT-Hooks, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each ſide, one near the trunnion hole, and the other at the train, diſtinguiſhed by the name of *fore* and *hind draught-hooks*. Large guns have draught-hooks near the middle tranſom, to which are fixed the chains that ſerve to keep the ſhafts of the limbers on a march. The fore and hind hooks are uſed for drawing a gun backwards or forwards, by men with ſtrong ropes, called *draught-ropes*, fixed to theſe hooks.

DRAUGHT-Horſe, in farming, a ſort of coarſe-made horſe, deſtined for the ſervice of a cart or plough.

DRAWBACK, in commerce, certain duties, either of the cuſtoms or of the exciſe, allowed upon the exportation of ſome of our own manufactures; or upon certain foreign merchandiſe, that have paid duty on importation.

The oaths of the merchants importing and exporting are required to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and theſe may be made by the agent or huſband of any corporation or company; or by the known ſervant of any merchant uſually employed in making his entries, and paying his cuſtoms. In regard to foreign goods entered outward, if leſs quantity or value be fraudulently ſhipped out than what is expreſſed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the ſame. Foreign goods exported by certificate in order to obtain the drawback, not ſhipped or exported, or relanded in Great Britain, unleſs in caſe of diſtreſs to ſave them from periſhing, are to loſe the benefit of the drawback, and are forfeited, or their value, with the veſſel, horſes, carriages, &c. employed in the relanding thereof; and the perſons employed in the relanding them, or by whoſe privity they are relanded, or into whoſe hands they ſhall knowingly come, are to forfeit double the amount of the drawback. Officers of the cuſtoms conniving at or aſſiſting in any fraud relating to certificate goods, beſides other penalties, are to forfeit their office, and ſuffer ſix months impriſonment without bail or mainprize; as are alſo maſters, or perſons belonging to the ſhips employed therein. Bonds given for the exportation of certificate-goods to Ireland muſt not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and ſeals of the collector or comptroller, &c. of the cuſtoms be produced, teſtifying the landing.

DRAW-Bridge, a bridge made after the manner of a float, to draw up or let down, as occaſions ſerve, before the gate of a town or caſtle. See BRIDGE.

A draw-bridge may be made after ſeveral different ways; but the moſt common are made with plyers, twice the length of the gate, and a foot in diameter. The inner ſquare is traverſed with a croſs, which ſerves for a counterpoiſe; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or braſs.

In navigable rivers it is ſometimes neceſſary to make the middle arch of bridges with two moveable platforms, to be raiſed occaſionally, in order to let the maſts and rigging of ſhips paſs through. This kind of draw-bridge is repreſented in Plate CLXV. where A B is the width of the middle arch; A L and B L, the two piers that ſupport the draw-bridge N O, one of the platforms of which is raiſed, and the other let down, having the beam P Q for its plyer. To N O are ſuſpended two moveable braces E H, E H; which reſting on the ſupport E, preſs againſt the bracket M, and thereby ſtrengthen the draw-bridge. Theſe braces are conducted to the reſt by means of the weight S, pulling the chain S L F.

DRAW-Net, a kind of net for taking the larger ſort of wildfowl, which ought to be made of the beſt ſort of pack-thread, with wide meſhes; they ſhould be about two fathoms deep and ſix long, verged on each ſide with a very ſtrong cord, and ſtretched at each end on long poles. It ſhould be ſpread ſmooth and flat upon the ground; and ſtrewed over with graſs, ſedge, or the like, to hide it from the fowl; and the ſportſman is to place himſelf in ſome ſhelter of graſs, fern, or ſome ſuch thing.

DRAWING, in general, denotes the action of pulling out, or hauling along; thus we read of tooth-drawing, wire-drawing, &c.

DRAWING,

THE art of repreſenting the appearances of objects upon a plain ſurface, by means of lines, ſhades, and ſhadows, formed with certain materials adapted to the purpoſe.

§ 1. *Of the proper Materials for Drawing, and the Manner of uſing them.*

THE firſt thing neceſſary for a beginner is to furniſh himſelf with proper materials, ſuch as black-lead pencils, crayons of black, white, or red chalk, crow-quill pens, a rule and compaſſes, camels-hair pencils, and Indian ink. He muſt accuſtom himſelf to hold the pencil farther from the point than one does a pen in writing; which will give him a better command of it, and contribute to render the ſtrokes more free and bold. The uſe of the pencil is to draw the firſt ſketches or outlines of the piece, as any ſtroke or line that is amiſs may in this be more eaſily rubbed out than in any other thing; and when he has made the ſketch as correct as he can with the pencil, he may then draw carefully the beſt outline he has got, with his crow-quill pen and ink (A); after which he may diſcharge the pencil-lines, by rubbing the piece gently with the crumb of ſtale bread or India rubber. Having thus got the outline clear, his next work is to ſhade the piece properly, either by drawing fine ſtrokes with his pen where it requires to be ſhaded, or by waſhing it with his pencil and the Indian ink. As to his rule and compaſſes, they are never or very rarely to be uſed, except in meaſuring the proportions of figures after he has drawn them, to prove whether they are right or not; or in houſes, fortifications, and other pieces of architecture.

§ 2. *Of drawing Lines, Squares, Circles, and other regular and irregular Figures.*

HAVING got all theſe implements in readineſs, the firſt practice muſt be to draw ſtraight and curve lines, with eaſe and freedom, upwards and downwards, ſideways to the right or left, or in any direction whatſoever. He muſt alſo learn to draw, by command of hand, ſquares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar; ſo is geometry to drawing. The practice of drawing theſe ſimple figures till he is maſter of them, will enable him to imitate, with greater eaſe and accuracy, many things both in nature and art. And here it is proper to admoniſh him, never to be in a hurry; but to make himſelf perfectly maſter of one figure before he proceeds to another: the advantage, and even neceſſity, of this, will appear as he proceeds. Two obſervations more may be added: 1. That he accuſtom himſelf to draw all his figures very large, which is the only way of acquiring a free bold manner of deſigning. 2. That he practiſe drawing till he has gained a tolerable maſter of his pencil, before he attempts to ſhadow any figure or object of any kind whatever.

§ 3. *Of Drawing Eyes, Ears, Legs, Arms, Hands, Feet, &c.*

AS to the drawing of eyes and ears, legs and arms, the learner will have very little more to do than to copy carefully the examples given in Plate CLXVI. and CLXVII. taken from Sebaſtian le Clerc's drawing book. But the actions and poſtures of the hands are ſo many and various, that no certain rules can be given for drawing them, that will univerſally hold good. Yet as the hands and feet are difficult members to draw, it is very neceſſary, and well worth while, to beſtow ſome time and pains about them, carefully imitating their various poſtures and actions, ſo as not only to avoid all lameneſs and imperfection, but alſo to give them life and ſpirit. To arrive at this, great care, ſtudy, and practice, are requiſite; particularly in imitating the beſt prints or drawings that can be got of hands and feet (ſome good examples of which are given in Plate CLXVII.); for, as to the mechanical rules of drawing them by lines and meaſures, they are not only perplexed and difficult, but alſo contrary to the practice of the beſt maſters. One general rule, however, may be given (which is univerſally to be obſerved in all ſubjects), and that is, Not to finiſh perfectly at firſt any ſingle part, but to ſketch out faintly, and with light ſtrokes of the pencil, the ſhape and proportion of the whole hand, with the action and turn of it; and after conſidering carefully whether this firſt ſketch be perfect, and altering it wherever it is amiſs, you may then proceed to the bending of the joints, the knuckles, the veins, and other ſmall particulars, which when the learner has got the whole ſhape and proportion of the hand or foot, will not only be more eaſily but alſo more perfectly deſigned.

§ 4. *Of Drawing Faces.*

THE head is uſually divided into four equal parts. (1.) From the crown of the head to the top of the forehead. (2.) From the top of the forehead to the eye-brows. (3.) From the eye-brows to the bottom of the noſe. (4.) From thence to the bottom of the chin. But this proportion is not conſtant; theſe features in different men being often very different as to length and ſhape. In a well-proportioned face, however, they are nearly right. To direct the learner therefore in forming a perfect face, his firſt buſineſs is to draw an oval, or rather the form of an egg; in the middle

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(A) The ink made uſe of for this purpoſe muſt not be common, but Indian ink; which is much ſofter than the other, and does not run; by mixing it with water, it may be made to any degree of ſtrength, and uſed in a pen like common ink.

middle of which, from the top to the bottom, draw a perpendicular line. Through the centre or middle of this line draw a diameter line, directly acroſs from one ſide to the other of your oval. On theſe two lines all the features of your face are to be placed as follows: Divide your perpendicular line into four equal parts: the firſt muſt be allotted to the hair of the head; the ſecond is from the top of the forehead to the top of the noſe between the eye-brows; the third is from thence to the bottom of the noſe; and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is always ſuppoſed to be the length of five eyes; you muſt therefore divide it into five equal parts, and place the eyes upon it ſo as to leave exactly the length of one eye betwixt them. This is to be underſtood only of a full front face, Plate CLXVI. fig. *a*; for if it turn to either ſide, then the diſtances are to be leſſened on that ſide which turns from you, leſs or more in proportion to its turning, (fig. *b b b*.) The top of the ear is to riſe parallel to the eye-brows, at the end of the diameter line; and the bottom of it muſt be equal to the bottom of the noſe. The noſtrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth muſt always be placed upon the perpendicular line.

§ 5. *Of Drawing Human Figures.*

WHEN the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at length. In order to which, let him firſt ſketch the head; then draw a perpendicular line from the bottom of the head ſeven times its length (for the length of the head is about one-eighth part of the length of the figure).

The beſt proportioned figures of the ancients are 7½ heads in height. If, therefore, the figure ſtands upright, as fig. (*a*, Plate CLXVIII.) draw a perpendicular line from the top of the head to the heel, which muſt be divided into two equal parts. The bottom of the belly is exactly the centre. Divide the lower part into two equal parts again, the middle of which is the middle of the knee. For the upper part of the figure, the method muſt be varied. Take off with your compaſſes the length of the face (which is three parts in 4 of the length of the head); from the throat-pit to the pit of the ſtomach is one face, from thence to the navel is another, and from thence to the lower rim of the belly is a third. The line muſt be divided into ſeven equal parts. Againſt the end of the firſt diviſion, place the breaſts; the ſecond comes down to the navel; the third to the privities; the fourth to the middle of the thigh; the fifth to the lower part of the knee; the ſixth to the lower part of the calf; and the ſeventh to the bottom of the heel, the heel of the bearing leg being always exactly under the pit of the throat. But as the eſſence of all drawing conſiſts in making at firſt a good ſketch, the learner muſt in this particular be very careful and accurate; he ought to draw no one part perfect or exact till he ſee whether the whole draught be good; and when he has altered that to his mind, he may then finiſh one part after another as curiouſly as he can.

There are ſome who, having a ſtatue to copy, begin with the head, which they finiſh, and then proceed in the ſame manner to the other parts of the body, finiſhing as they go: but this method generally ſucceeds ill; for if they make the head in the leaſt too big or too little, the conſequence is a diſproportion between all the parts, occaſioned by their not having ſketched the whole proportionably at firſt. Let the learner remember, therefore, in whatever he intends to draw, firſt to ſketch its ſeveral parts, meaſuring the diſtances and proportions between each with his finger or pencil, without uſing the compaſſes; and then judge of them by the eye, which by degrees will be able to judge of truth and proportion, and will become his beſt and principal guide. And let him obſerve, as a general rule, Always to begin with the right ſide of the piece he is copying: for by that means he will always have what he has done before his eyes; and the reſt will follow more naturally, and with greater eaſe: whereas if he begin with the left ſide, his hand and arm will cover what he does firſt, and deprive him of the ſight of it; by which means he will not be able to proceed with ſo much eaſe, pleaſure, or certainty.

As to the order and manner of proceeding in drawing the human body, he muſt firſt ſketch the head; then the ſhoulders in the exact breadth; then draw the trunk of the body, beginning with the arm-pits (leaving the arms till afterwards), and ſo draw down to the hips on both ſides; and be ſure he obſerve the exact breadth of the waiſt. When he has done this, let him then draw that leg which the body ſtands upon, and afterwards the other which ſtands looſe; then the arms, and laſt of all the hands.

He muſt take notice alſo of the bowings and bendings that are in the body; making the part which is oppoſite to that which bends correſpond to it in bending with it. For inſtance: If one ſide of the body bend in, the other muſt ſtand out anſwerable to it; if the back bend in, the belly muſt ſtick out; if the knee bend out, the ham muſt fall in; and ſo of any other joint in the body. Finally, he muſt endeavour to form all the parts of the figure with truth, and in juſt proportion: not one arm or one leg bigger or leſs than the other; not broad Herculean ſhoulders, with a thin and ſlender waiſt; nor raw and bony arms, with thick and gouty legs: but let there be a kind of harmonious agreement amongſt the members, and a beautiful ſymmetry throughout the whole figure.

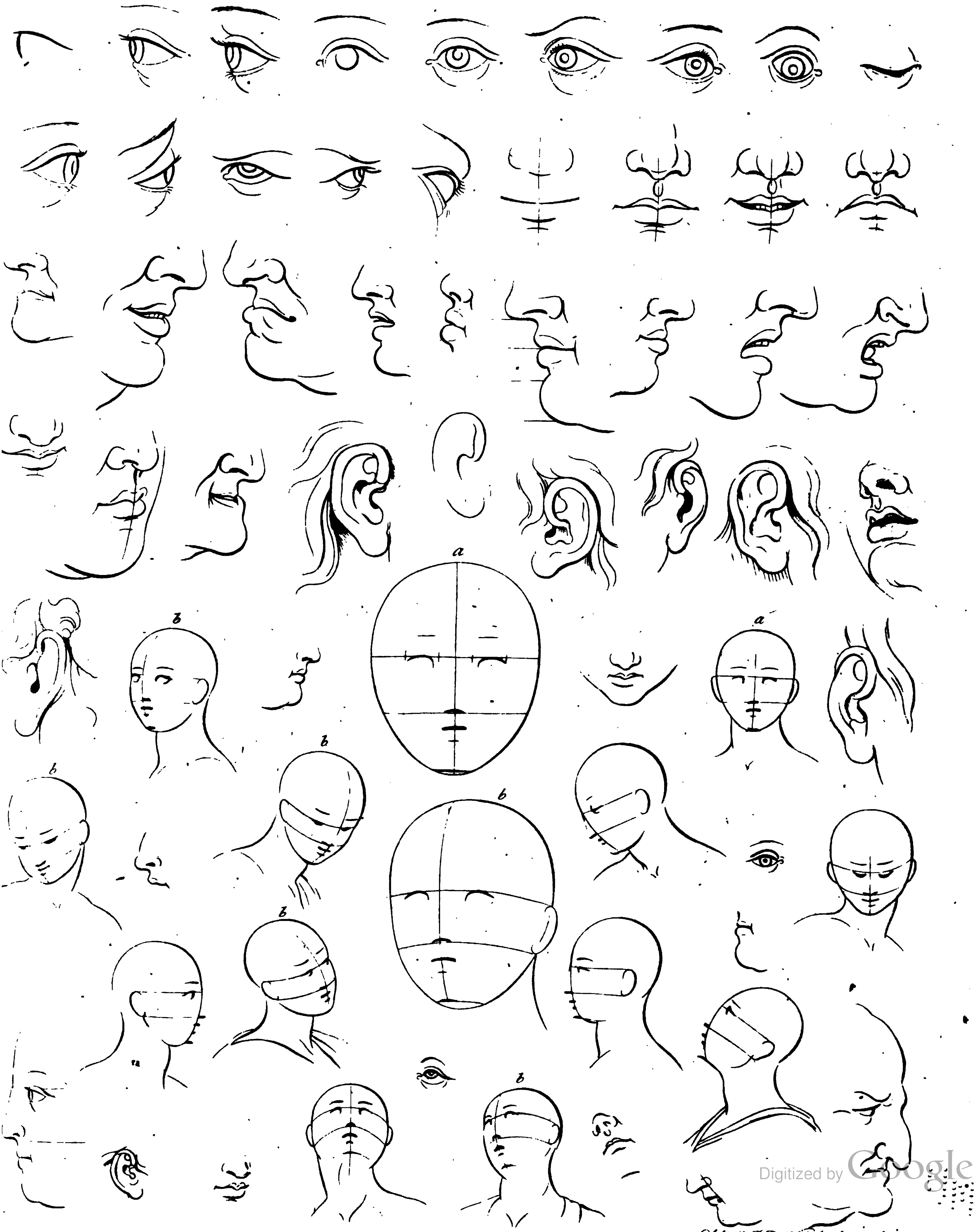
Proportions and Meaſures of the Human Body. The centre or middle part, between the two extremes of the head and feet of a new born child, is in the navel, but that of an adult is in the os pubis; and the practice of dividing the meaſures of children into four, five, or ſix parts, whereof the head is one, is made uſe of by painters and ſculptors.

A child of two years old has about five heads in its whole length, but one of four or five years old has near ſix; about the fifteenth or ſixteenth year, ſeven heads are the proportion or meaſure, and the centre inclines to the upper part of the pubis. Hence it appears, as the growth of the body advances, there is a gradual approach to the proportion of an adult of near eight heads in the whole length, of which, as mentioned above, the head makes one.

Agreeable to theſe principles, the following Table is conſtructed, exhibiting the proportions of the parts of a man and of a woman, as they were fixed by the ancients, and meaſured by M. Audran from the A-

DRAWING.

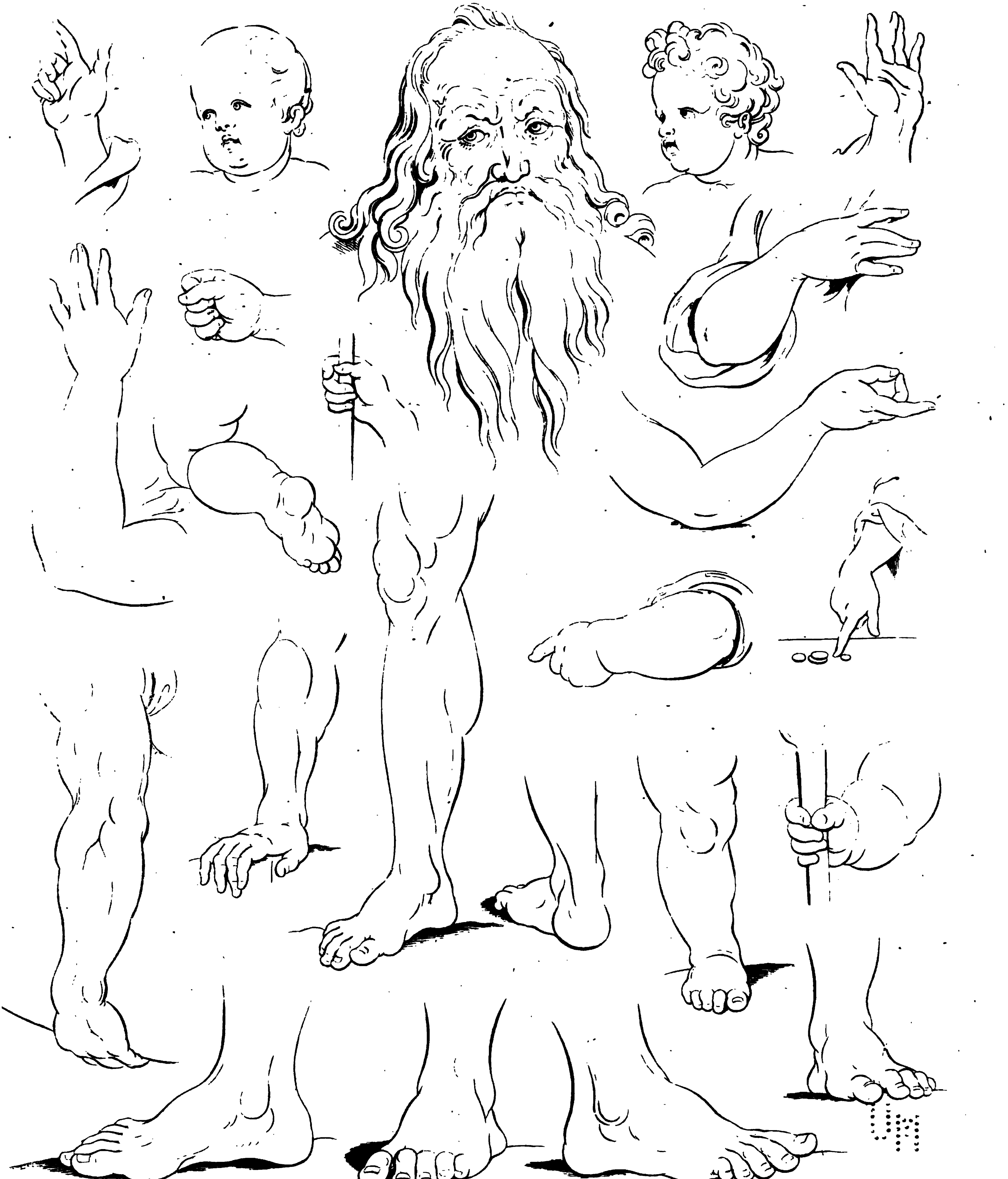
Plate CLXVI.



A. Bell Prin. Wal. Sculptor fecit.

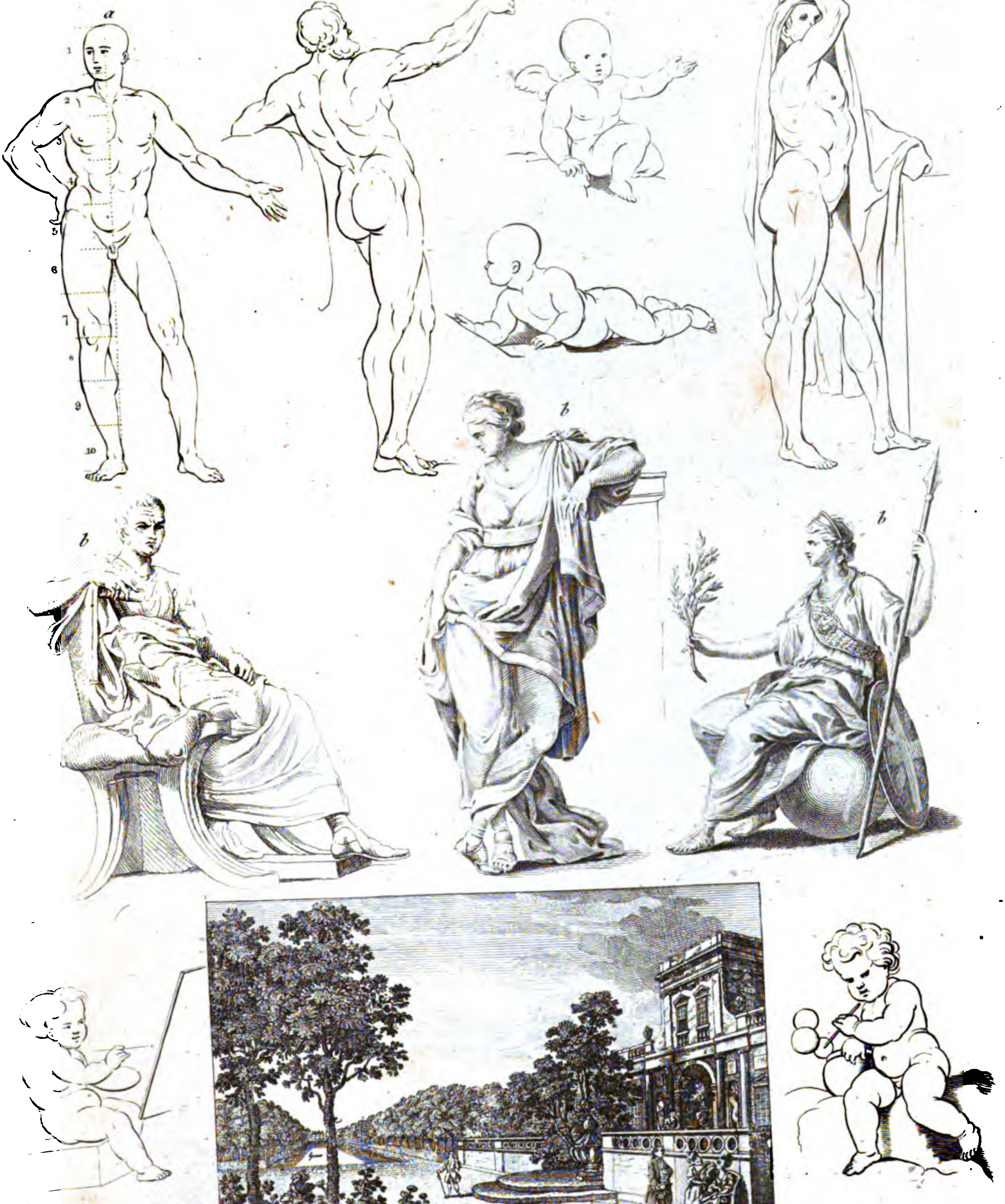
DRAWING.

Plate CLXVII.

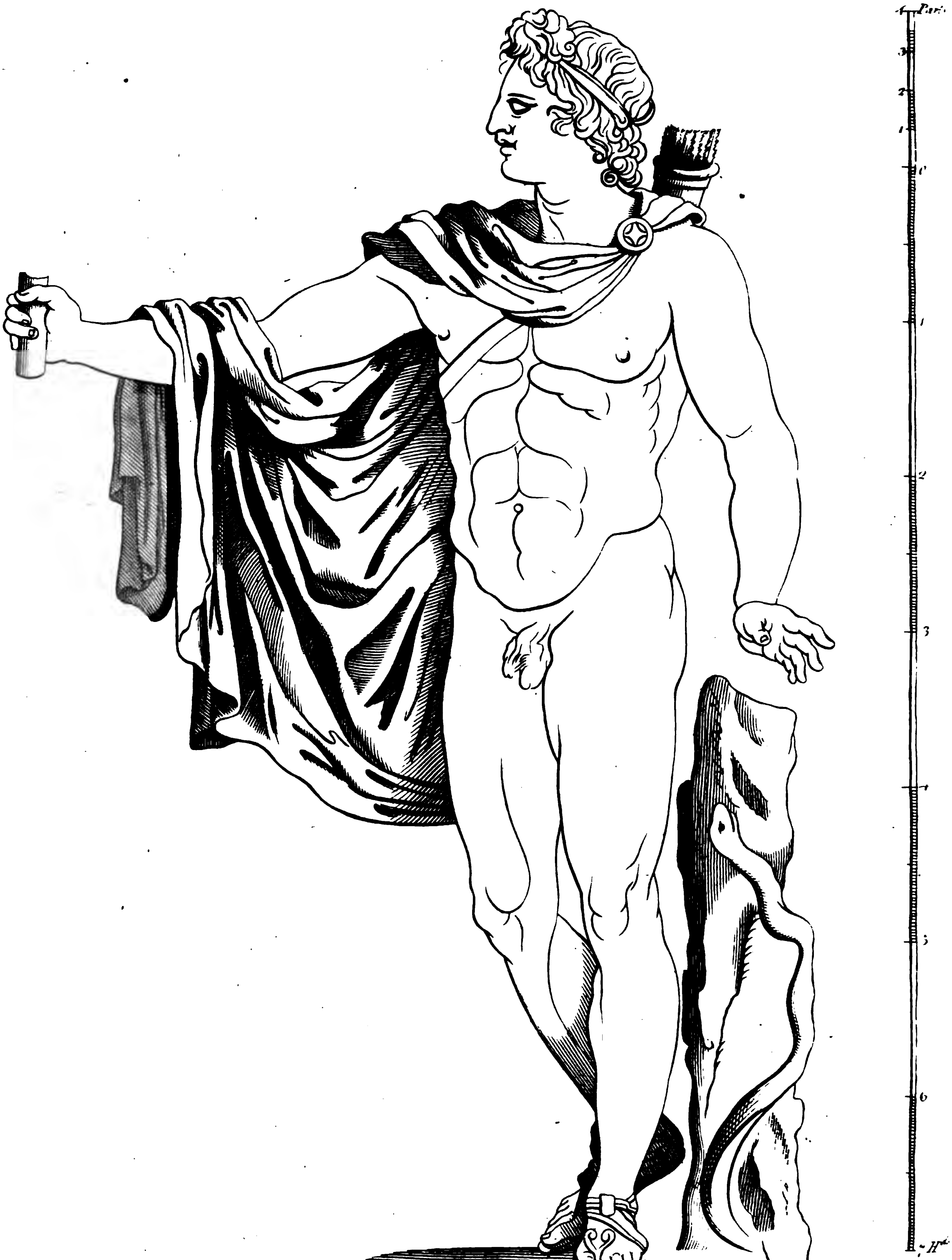


A. Bell Prin. Wal. Sculptor fecit

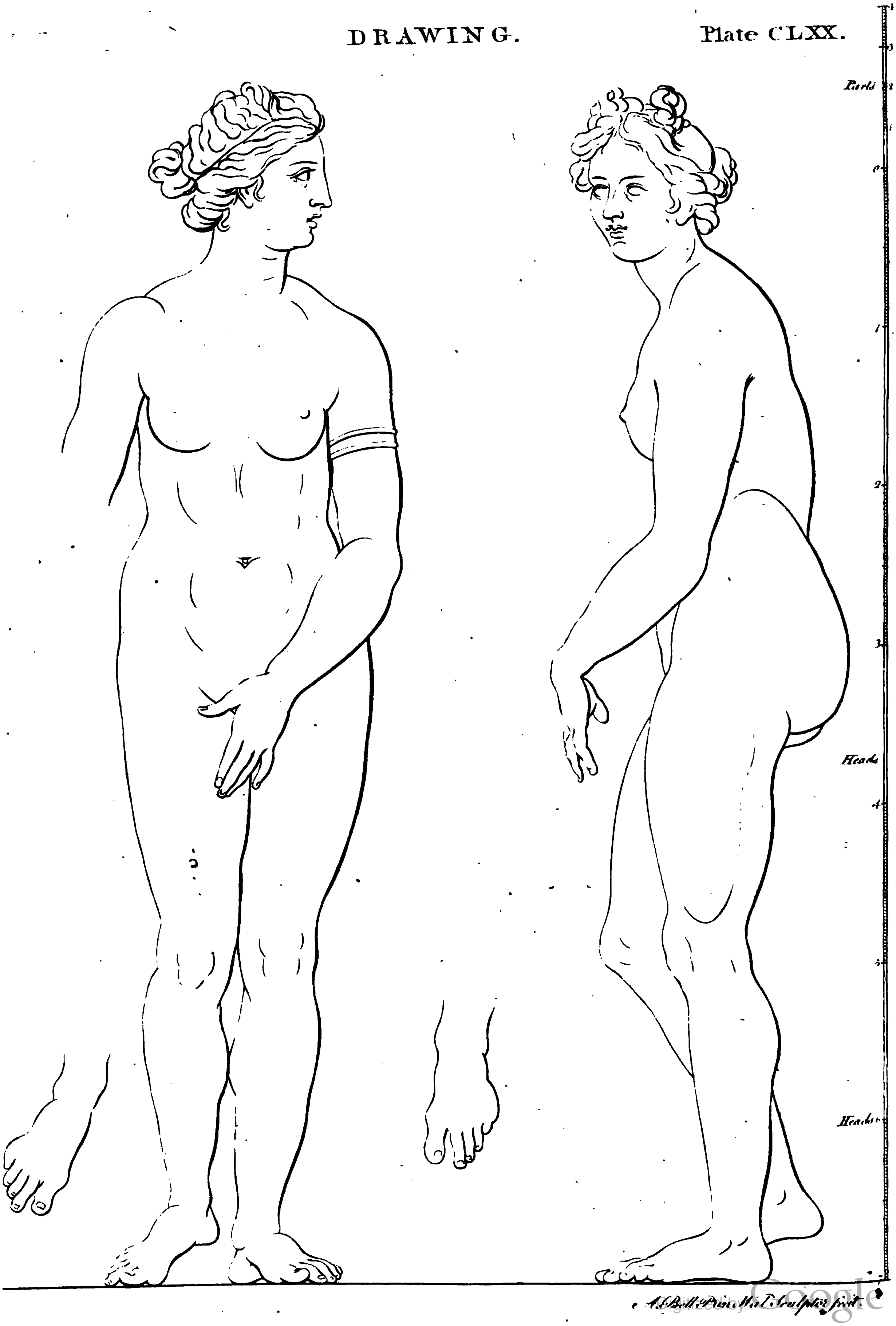
DRAWING. Plate CLXVIII.



J. Bell Sculp.



A. Bell Prin. Wal. Sculptor fecit.



A. Bell Prin. Wal. Sculptor fecit.

pollo Pythius (Plate CLXIX.) in the garden of the Vatican at Rome, and the Venus Aphroditus (Plate CLXX.) belonging to the family of the Medicis. Suppoſing the figures to ſtand upright and duly poiſed on both legs, the whole height of the former is divided into 31½ parts, being 7 heads 3 parts and 6 minutes; and that of the latter into 31 parts, being 7 heads and 3 parts.

Length of the Head and Trunk of the Body.

	Apollo.			*Venus.*		
	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the top of the head to the bottom of the chin 4 parts or	1	0	0	1	0	0
the bottom of the chin to the top of the ſternum or breaſt-bone	0	1	7	0	1	8
the top of the ſternum to the pit of the ſtomach	0	3	10	0	3	6
the pit of the ſtomach to the navel	0	2	10	0	2	7
the navel to the pubis	0	3	6	0	3	9
Length of the head and trunk of the body	3	3	9	3	3	6

Length of the Lower Extremities.

	Apollo.			*Venus.*		
	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the pubis to the ſmall of the thigh above the patella or knee-pan	1	2	6	1	2	3
the ſmall of the thigh to the joint or middle of the knee	0	1	9	0	1	6
the joint of the knee to the ſmall of the leg above the ankle	1	1	9	1	2	0
the top to the bottom of the ankle	0	1	0	0	1	0
the bottom of the ankle to the bottom of the heel	0	0	9	0	0	9
Length of the lower extremities	3	3	9	3	3	6
Length of the head and trunk, as above	3	3	9	3	3	6
Total length of the figures	7	3	6	7	3	0

Length of the Fore-Arm or Upper Extremities.

	Apollo.			*Venus.*		
	Hds.	Pts.	Min.	Hds.	Pts.	Min.
From the top of the ſhoulder to the elbow	1	2	3	1	2	3
the elbow to the hand	1	1	2	1	0	6
the joint of the hand to the root of the middle finger	0	1	8	0	1	6
the root to the tip of the middle finger	0	1	10	0	1	7
Length of the upper extremities	3	2	11	3	1	10

	Apollo.			*Venus.*		
	Hds.	Pts.	Min.	Hds.	Pts.	Min.
Breadth between the outward angles of the eyes	0	1	6	0	1	7
of the face at the temples	0	2	2	0	2	2
of the upper part of the neck	0	2	0	0	1	11
over the ſhoulders	2	0	0	1	3	8
of the body below the arm-pits	1	2	5	1	1	8
between the nipples	1	0	7	0	3	8
from the bottom of the chin to the horizontal line of the nipples	1	0	7	1	0	1
of the body at the ſmall of the waiſt	1	1	[illegible]	1	0	8
over the loins or os ilium	1	1	3	1	1	6
over the haunches or tops of the thigh-bones	1	1	5	1	2	3
of the thigh at the top	0	3	0	0	3	1
of the thigh below the middle	0	2	8½	0	2	7
of the thigh above the knee	0	1	8	0	2	0
of the leg below the knee	0	1	6	0	1	10½
at the calf of the leg	0	2	4	0	2	3
below the calf	0	1	7	0	1	11½
above the ankle	0	1	2	0	1	2
of the ankle	0	1	4	0	1	3
below the ankle	0	1	1½	0	1	1
middle of the foot	0	1	4	0	1	3
at the roots of the toes	0	1	7	0	1	7
of the arm over the biceps muſcle	0	1	8	0	1	9
of the arm above the elbow	0	1	6	0	1	5
of the arm below the elbow over the long ſupinator	0	1	10	0	1	7
at the wriſt	0	1	1	0	1	0
of the hand over the firſt joint of the thumb	0	1	9	0	1	8
of the hand over the roots of the fingers	0	1	7	0	1	6

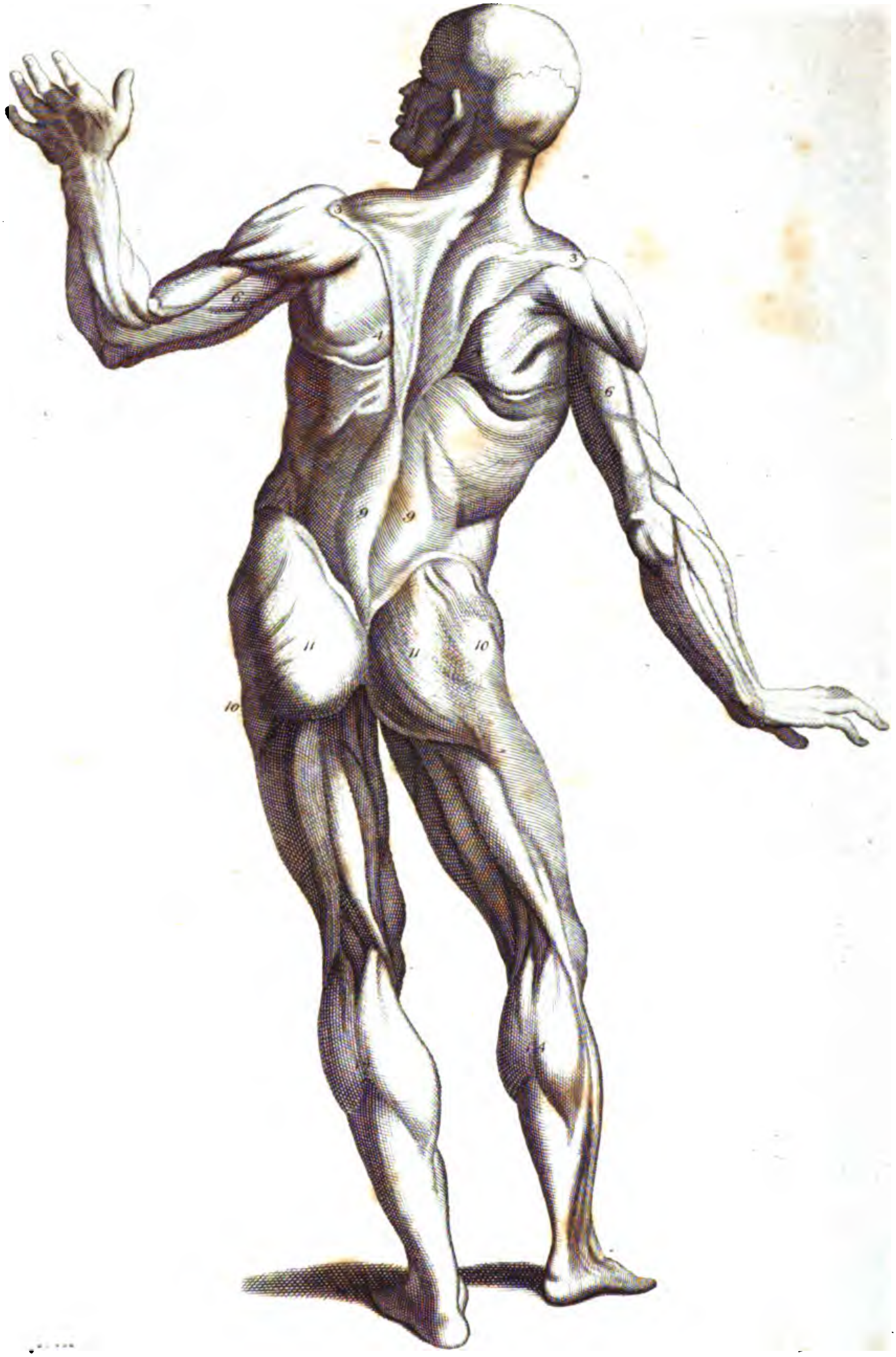
	Apollo.			*Venus.*		
	Hds.	Pts.	Min	Hds.	Pts.	Min.
Breadth over the heads of the ſcapulæ or ſhoulder blades	1	2	0	1	1	4
Length of both arms and hands, each of the Apollos being 3h. 2p. 11m. and the Venus 3h. 1p. 5m.	7	1	10	6	2	10
Breadth betwixt the tips of the middle fingers of each hand when the arms are ſtretched out horizontally	8	3	10	8	0	2
Side View.						
Length from the top of the head to the ſhoulder	1	1	8	1	1	6
from the top of the ſhoulder to the loins above the hip	1	3	3	1	1	7
from the loins to the lower part of the hip	1	0	2	1	2	1
from the hip to the ſide of the knee, oppoſite to the top of the patella	1	2	0	1	0	11
from the ſide of the knee to the bottom of the heel	2	0	5	2	0	11
Length of the figures	7	3	6	7	3	0
Side View.						
Thickneſs from the fore to the back part of the ſkull	0	3	6	0	3	4
from the wing of the noſe to the tip of the ear	0	1	8½	0	1	6
of the upper part of the neck	0	2	0	0	1	11
from the breaſt to the back over the nipples	1	0	6	1	0	6
from the belly to the ſmall of the back	0	3	6	0	3	7
from the belly above the navel to the back of the loins	0	3	9	1	0	2
from the bottom of the belly to the round of the hip	1	0	0	1	0	5
from the fore-part of the thigh to the bottom of the hip	0	3	2	0	3	7
of the thigh at the middle	0	3	3	0	3	6½
of the thigh above the knee	0	2	1	0	2	3
at the middle of the knee below the patella	0	2	1	0	2	2
of the leg below the knee	0	1	9	0	1	11
of the leg at the calf	0	1	8	0	1	9
of the leg at the ankle	0	1	5½	0	1	4
of the foot at the thickeſt part	0	0	0	0	1	3
length of the foot	1	0	6	1	0	4½
from the fore-part of the bend of the foot to the lower and back part of the heel	0	0	0	0	2	2
of the arm over the biceps	0	2	0	0	1	9
over the elbow	0	1	6	0	1	6
below the elbow	0	1	5	0	1	7
at the wriſt	0	1	1	0	0	11
below the joint of the wriſt	0	1	0	0	0	10
of the hand at the roots of the fingers	6	0	5½	0	0	5
at the roots of the nails	0	0	3½	0	0	3

The other moſt admired antique ſtatues differ a little from theſe proportions, the Laocoon meaſuring 7h. 2p. 3m. the Hercules 7h. 3p. 7m. the Pyramus 7h. 2p. the Antinous 7h. 2p. the Grecian ſhepherdeſs 7h. 3p. 6m. and the Mirmillo 8h. But all their other proportions are allowed to be harmonious and agreeable to the characters of the figures they repreſent.

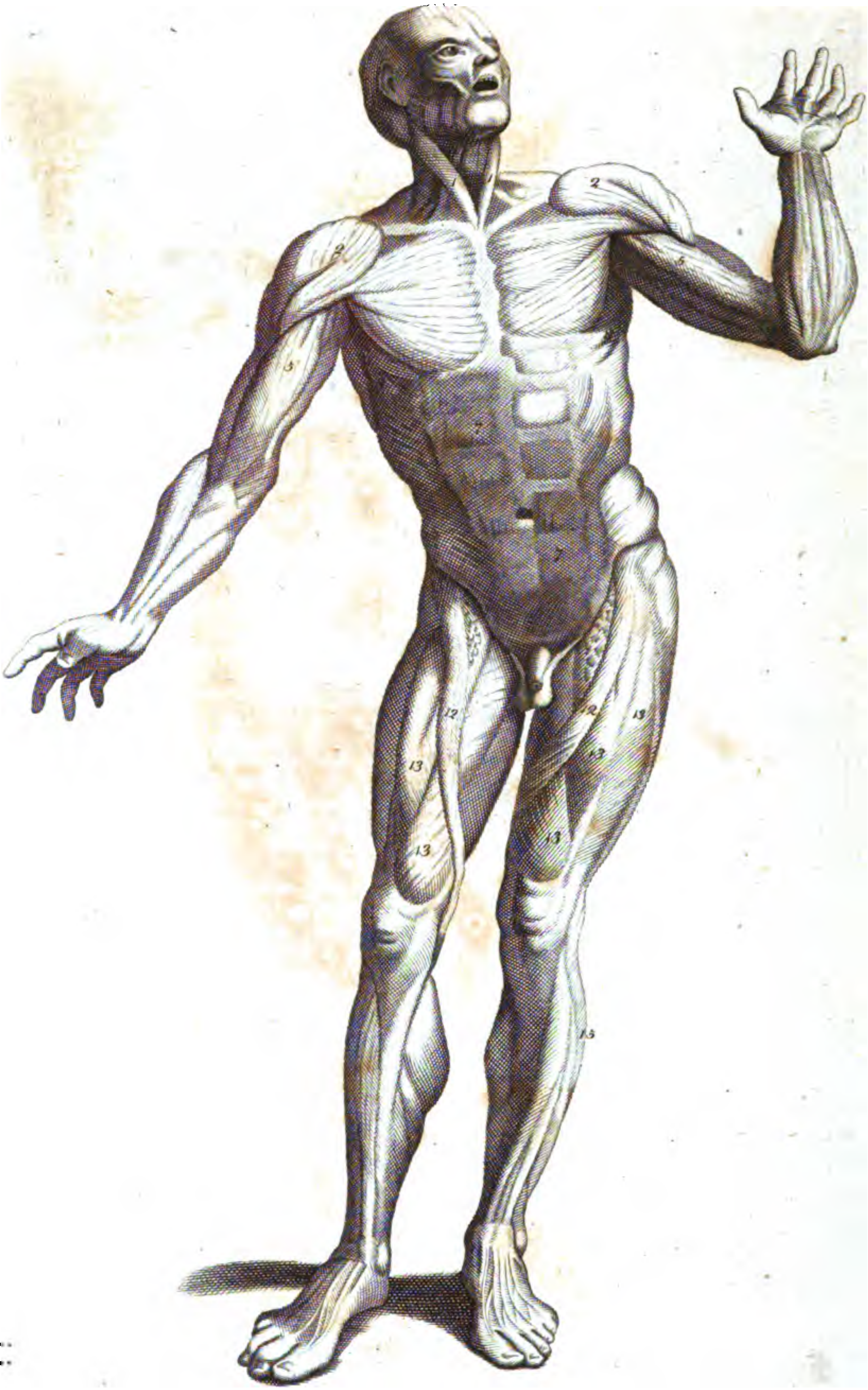
The moſt remarkable differences of the ſymmetry or proportions of a man and of a woman to be obſerved from the Table are: Firſt, the ſhoulders of a man are broader, meaſuring two heads; and the haunches narrower, meaſuring 1h. 1p. 5m. whereas the ſhoulders of a woman meaſure only 1h. 3p. 8m. and the haunches meaſure 1h. 2p. 3m. The ſternum or breaſt bone of a man is longer, meaſuring 3p. 8m. and the ſternum of the woman only 3p. 3m. On the contrary, the pelvis of a man is leſs, meaſuring from the top to the bottom only 4p. whereas the pelvis of a woman meaſures from the top to the bottom 4p. 3m.

It is a leading principle, in which every perſon converſant in deſigning has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monſtrous and extravagant figures; and it is alſo univerſally admitted, that the ancient Greek and Roman ſculptors attained the higheſt ſucceſs in producing the moſt perfect models.

The greateſt of the modern artiſts who have examined their figures with attention admit, that ſeveral of the ancient ſculptors in ſome degree have excelled nature, they never having found any man ſo perfect in all his parts as ſome of their figures are. Their opportunities indeed were great; Greece abounded with beauties; and Rome being miſtreſs of the world, every thing that was curious and beautiful was brought to it from all parts. Their motives were alſo powerful; religion, glory, and intereſt. They conſidered it as a kind



A. Bell Prin. Wal. Sculptor fecit.



A.Bell Prin. Wal. Sculptor fecit.

kind of religious worſhip to give the figures of their gods ſo much nobleneſs and beauty as to be able to attract the love and veneration of the people. Their own glory was alſo concerned, particular honours being beſtowed on thoſe who ſucceeded; and for their fortune they had no further care to take when they once arrived at a certain degree of merit.

Attitudes and Action of the Muſcles. If a ſtrong perſon is to be repreſented in a vigorous action, ſuch as Hercules, &c. after a ſuitable proportion to ſuch a figure and the action is deſigned, the parts or limbs employed in the chiefeſt force of the action ought to be conſidered. If the figure is ſtanding, the foot muſt be placed in a right line, or perpendicular to the trunk or bulk of the body, where the centre of gravity may be placed *in æquilibrio.* This centre is determined by the heel; or, if the figure is upon tiptoe, then the ball of the great toe is in the centre. The muſcles of the leg which ſupports the body ought to be ſwelled, and their tendons drawn more to an extenſion than thoſe of the other leg, which is only placed ſo as to receive the weight of the body towards that way to which the action inclines it. For example, ſuppoſe Hercules with a club ſtriking at any thing before him towards the left ſide: Then let his right leg be placed ſo as to receive the whole weight of the body, and the left looſely touching the ground with its toes. Here the external muſcles of the right leg ought to be expreſſed very ſtrong; but thoſe of the left ſcarcely appearing more than if it were in ſome ſedentary poſture, except in the preſent caſe. The foot being extended, the muſcles which compoſe the calf of the leg are in action and appear very ſtrong; though it is not meant that *all* the muſcles of the right leg, which ſupports the weight of the body, ought to be expreſſed very ſtrong or equally ſwelled, but thoſe moſt tumified which are chiefly concerned in the action or poſture that the leg is then in. For example, if the leg or tibia is extended, then the extending muſcles placed on the thigh are moſt ſwelled: if it is bended, then the bending muſcles and their tendons appear moſt. The like may be obſerved of the whole body in general when it is put into vigorous action. The Laocoon in the Vatican garden at Rome furniſhes an example of this muſcular appearance through the whole; but in the Antinous, Apollo, and other figures of the ancients, in the Vatican and other places, in poſtures where no conſiderable actions are deſigned, we ſee their muſcles expreſſed but faintly, or ſcarcely appearing.

The clavicles or collar bones, and muſcles in general, do not appear in women as in men; nor will any action in which a woman uſes her utmoſt ſtrength occaſion ſuch ſwellings or riſings of the muſcles to appear as they do in men, ſince the great quantity of fat placed under the ſkin of women ſo clothes their muſcles, &c. as to prevent any ſuch appearances.

Effects of the Exertion of the Muſcles. The following are the moſt obvious effects of the exertion of ſeveral of the muſcles; of thoſe, to wit, which chiefly demand the attention of an artiſt.

If either of the maſtoid muſcles (Plate CLXXI. 1. 1.) act, the head is turned to the contrary ſide, and the muſcle which performs that action appears very plain under the ſkin.

If the arms are lifted up, the deltoid muſcles placed on the ſhoulders, which perform that action, ſwell, and make the extremities of the ſpines of the ſhoulder-blades (Plate CLXXII. 3. 3.), called the tops of the ſhoulders, appear indented or hollow.

The ſhoulder-blades following the elevation of the arms, their baſes (Plate CLXXII. 4. 4.) incline at that time obliquely downward.

If the arms are drawn down, put forwards, or pulled backwards, the ſhoulder-blades neceſſarily vary their poſitions accordingly. All theſe particulars are to be learned by conſulting the life only: when being well acquainted with what then appears in every action, the artiſt will be able to form an adequate idea how it ought to be expreſſed. Theſe circumſtances are little known; hence ſeldom attended to in deſigning.

When the cubit or fore-arm is bended, the biceps (Plate CLXXI. 5. 5.) has its belly very much raiſed, as appears in the left arm. The like may be obſerved of the triceps (Plate CLXXII. 6. 6.) when the arm is extended, as obſerved in the right arm.

The ſtraight muſcles of the abdomen (Plate CLXXI. 7. 7.) appear very ſtrong when riſing from a decumbent poſture.

Thoſe parts of the great ſerratus muſcle (ib. 8. 8.) which are received in the teeth or beginnings of the oblique deſcending muſcle immediately below, are very much ſwelled when the ſhoulder on the ſame ſide is brought forwards; that ſerratus muſcle then being in action in drawing the ſcapula forwards.

The long extending muſcles of the trunk (Plate CLXXII. 9. 9.) act alternately in walking, after this manner: If the right leg bears the weight of the body, and the left is in tranſlation as on tiptoe, the laſt mentioned muſcles of the back on the left ſide may be obſerved to be tumified on the other ſide about the region of the loins, and ſo on the other ſide.

The trochanters, or outward and uppermoſt heads of the thigh-bones (Plate CLXXII. 10. 10.), vary in their poſitions in ſuch a manner as no preciſe obſervations can explain their ſeveral appearances; but the ſtudy after the life ought to be carefully attended to.

If the thigh is extended, as when the whole weight of the body reſts on that ſide, the gluteus or buttock muſcle (Plate CLXXII. 11. 11.) makes a very different appearance from what offers at another time; but if the thigh is drawn backwards, that muſcle appears ſtill more and more tumified.

When the whole leg is drawn upwards forwards, and at the ſame time the foot is inclined inwards, the upper part of the ſartorius muſcle (Plate CLXXI. 12. 12.) appears riſing very ſtrong; in other poſitions of the thigh, that muſcle makes a furrowing appearance in its whole progreſs.

If a man is upon tiptoe, the extending muſcles of the leg placed on the fore-part of the thigh (Plate CLXXI. 13. 13. 13.), and thoſe of the foot that compoſe the calf of the leg (Plate CLXXII. 14. 14.), appear very ſtrong, and the long peronæus (Plate CLXXI. 15.) makes a conſiderable indentation or furrowing at that time in its progreſs on the outſide of the leg.

Many other remarks might here be offered; but a due attention to nature will ſoon diſcover them.

§ 6. *Of Light and Shade.*

After the learner has made himſelf in ſome meaſure perfect in drawing outlines, his next endeavour muſt be to ſhade them properly. It is this which gives an appearance of ſubſtance, ſhape, diſtance, and diſtinction, to whatever bodies he endeavours to repreſent, whether animate or inanimate. The beſt rule for doing this is, to conſider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and ſhades be placed according to that direction throughout the whole work. That part of the object muſt be lighteſt which hath the light moſt directly oppoſite to it; if the light falls ſideways on the picture, he muſt make that ſide which is oppoſite to it lighteſt, and that ſide which is fartheſt from it darkeſt. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head muſt be made lighteſt, the ſhoulders next lighteſt, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that ſtands fartheſt out, muſt be made the lighteſt, becauſe it comes neareſt to the light; and the light loſeth ſo much of its brightneſs, by how much any part of the body bends inward, becauſe thoſe parts that ſtick out hinder the luſtre and full brightneſs of the light from ſtriking on thoſe parts that fall in. Titian uſed to ſay, that he knew no better rule for the diſtribution of lights and ſhadows than his obſervations drawn from a bunch of grapes. Sattins and ſilks, and all other ſhining ſtuffs, have certain glancing reflections, exceeding bright where the light falls ſtrongeſt. The like is ſeen in armour, braſs pots, or any other glittering metal, where you ſee a ſudden brightneſs in the middle or centre of the light, which diſcovers the ſhining nature of ſuch things. Obſerve alſo, that a ſtrong light requires a ſtrong ſhade, a fainter light a fainter ſhade; and that an equal balance be preſerved throughout the piece between the lights and ſhades. Thoſe parts which muſt appear round require but one ſtroke in ſhading, and that ſometimes but very faint; ſuch parts as ſhould appear ſteep or hollow, require two ſtrokes acroſs each other, or ſometimes three, which is ſufficient for the deepeſt ſhade. Care muſt be alſo taken to make the outlines faint and ſmall in ſuch parts as receive the light; but where the ſhades fall, the outline muſt be ſtrong and bold. The learner muſt begin his ſhadings from the top, and proceed downward, and uſe his utmoſt endeavours both by practice and obſervation to learn how to vary the ſhadings properly; for in this conſiſts a great deal of the beauty and elegance of drawing. Another thing to be obſerved is, that as the human ſight is weakened by diſtances, ſo objects muſt ſeem more or leſs confuſed or clear according to the places they hold in the piece: Thoſe that are very diſtant,—weak, faint, and confuſed; thoſe that are near and on the foremoſt ground,—clear, ſtrong, and accurately finiſhed.

§ 7. *Of Drapery.*

In the art of clothing the figures, or caſting the drapery properly and elegantly upon them, many things are to be obſerved. 1. The eye muſt never be in doubt of its object; but the ſhape and proportion of the part or limb, which the drapery is ſuppoſed to cover, muſt appear; at leaſt ſo far as art and probability will permit: and this is ſo material a conſideration, that many artiſts draw firſt the naked figure, and afterwards put the draperies upon it. 2. The drapery muſt not ſit too cloſe to the parts of the body: but let it ſeem to flow round, and as it were to embrace them; yet ſo as that the figure may be eaſy, and have a free motion. 3. The draperies which cover thoſe parts that are expoſed to great light muſt not be ſo deeply ſhaded as to ſeem to pierce them; nor ſhould thoſe members be croſſed by folds that are too ſtrong, leſt by the too great darkneſs of their ſhades the members look as if they were broken. 4. The great folds muſt be drawn firſt, and then ſtroked into leſſer ones: and great care muſt be taken that they do not croſs one another improperly. 5. Folds in general ſhould be large, and as few as poſſible. However, they muſt be greater or leſs according to the quantity and quality of the ſtuffs of which the drapery is ſuppoſed to be made. The quality of the perſons is alſo to be conſidered in the drapery. If they are magiſtrates, their draperies ought to be large and ample; if country clowns or ſlaves, they ought to be coarſe and ſhort; if ladies or nymphs, light and ſoft. 6. Suit the garments to the body, and make them bend with it, according as it ſtands in or out, ſtraight or crooked; or as it bends one way or another; and the cloſer the garment ſits to the body, the narrower and ſmaller muſt be the folds. 7. Folds well imagined give much ſpirit to any kind of action; becauſe their motion implies a motion in the acting member, which ſeems to draw them forcibly, and makes them more or leſs ſtirring as the action is more or leſs violent. 8. An artful complication of folds in a circular manner greatly helps the effect of fore-ſhortenings. 9. All folds conſiſt of two ſhades, and no more; which you may turn with the garment at pleaſure, ſhadowing the inner ſide deeper, and the outer more faintly. 10. The ſhades in ſilk and fine linen are very thick and ſmall, requiring little folds and a light ſhadow. 11. Obſerve the motion of the air or wind, in order to draw the looſe apparel all flying one way: and draw that part of the garment that adheres cloſeſt to the body before you draw the looſer part that flies off from it; leſt, by drawing the looſe part of the garment firſt, you ſhould miſtake the poſition of the figure, and place it awry. 12. Rich ornaments, when judiciouſly and ſparingly uſed, may ſometimes contribute to the beauty of draperies. But ſuch ornaments are far below the dignity of angels or heavenly figures; the grandeur of whoſe draperies ought rather to conſiſt in the boldneſs and nobleneſs of the folds, than in the quality of the ſtuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind: but when in a calm place, and free from violent action, their draperies ſhould be large and flowing; that, by their contraſt and the fall of the folds, they may appear with grace and dignity. Thus much for drapery; an example or two of which are given in Plate CLXVIII. But ſee farther the articles Crayon and Painting.

§ 8. *On the Paſſions.*

The paſſions, ſays M. Le Brun, are motions of the ſoul, either upon her purſuing what ſhe judges to be for her good, or ſhunning what ſhe thinks hurtful to her; and commonly, whatever cauſes emotion of paſſion in the ſoul, creates alſo ſome action in the body. It is therefore neceſſary for a painter to know which are the different actions in the body that expreſs the ſeveral paſſions of the ſoul, and how to delineate them.

M. Le Brun has been extremely happy in expreſſing many of the paſſions, and the learner cannot ſtudy any thing better than the examples which he has left us of them. However, as M. De Piles juſtly obſerves, it is abſurd as well as impoſſible to pretend to give ſuch particular demonſtrations of them as to fix their expreſſion to certain ſtrokes, which the painter ſhould be obliged to make uſe of as eſſential and invariable rules. This, ſays he, would be depriving the art of that excellent variety of expreſſion which has no other principle than diverſity of imagination, the number of which is infinite. The ſame paſſion may be finely expreſſed ſeveral ways, each yielding more or leſs pleaſure in proportion to the painter's underſtanding and the ſpectator's diſcernment.

Though every part of the face contributes towards expreſſing the ſentiments of the heart, yet the eye-brow, according to M. Le Brun, is the principal ſeat of expreſſion, and where the paſſions beſt make themſelves known. It is certain, ſays he, that the pupil of the eye, by its fire and motion, very well ſhows the agitation of the ſoul, but then it does not expreſs the kind or nature of ſuch an agitation; whereas the motion of the eye-brow differs according as the paſſions change their nature. To expreſs a ſimple paſſion, the motion is ſimple; to expreſs a mixed paſſion, the motion is compound: if the paſſion be gentle, the motion is gentle; and if it be violent, the motion is ſo too. We may obſerve farther, ſays he, that there are two kinds of elevation in the eye-brows. One, in which the eye-brows riſe up in the middle; this elevation expreſſes agreeable ſenſations, and it is to be obſerved that then the mouth riſes at the corners: Another, in which the eye-brows riſe up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forhead, make the noſe, the mouth, and the eyes, follow the ſame motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the noſe and over the eyes, and the mouth riſes that way. It is to be obſerved alſo, that the mouth is the part of the face which more particularly expreſſes the emotions of the heart: for when the heart complains, the mouth falls at the corners; when it is at eaſe, the corners of the mouth are elevated; and when it has an averſion, the mouth ſhoots forward, and riſes in the middle.

"The head (ſays M. De Piles) contributes more to the expreſſion of the paſſions than all the other parts of the body put together. Thoſe ſeparately can only ſhow ſome few paſſions, but the head expreſſes them all. Some, however, are more peculiarly expreſſed by it than others: as humility, by hanging it down; arrogance, by lifting it up; languiſhment, by inclining it on one ſide; and obſtinacy, when with a ſtiff and reſolute air it ſtands upright, fixed, and ſtiff between the two ſhoulders. The head alſo beſt ſhows our ſupplications, threats, mildneſs, pride, love, hatred, joy, and grief. The whole face, and every feature, contributes ſomething: eſpecially the eyes; which, as Cicero ſays, are the windows of the ſoul. The paſſions they more particularly diſcover are, pleaſure, languiſhing, ſcorn, ſeverity, mildneſs, admiration, and anger; to which one might add joy and grief, if they did not proceed more particularly from the eye-brows and mouth; but when thoſe two paſſions fall in alſo with the language of the eyes, the harmony will be wonderful. But though the paſſions of the ſoul are moſt viſible in the lines and features of the face, they often require the aſſiſtance alſo of the other parts of the body. Without the hands, for inſtance, all action is weak and imperfect; their motions, which are almoſt infinite, create numberleſs expreſſions: it is by them that we *deſire, hope, promiſe, call, ſend back;* they are the inſtruments of *threatening, prayer, horror,* and *praiſe;* by them we *approve, condemn, refuſe, admit, fear, aſk;* expreſs our *joy* and *grief,* our *doubts, regrets, pain,* and *admiration.* In a word, it may be ſaid, as they are the language of the dumb, that they contribute not a little to ſpeak a language common to all nations, which is the language of painting. But to ſay how theſe parts muſt be diſpoſed for expreſſing the various paſſions, is impoſſible, nor can any exact rules be given for it, both becauſe the taſk would be infinite, and becauſe every one muſt be guided in this by his own genius and the particular turn of his own ſtudies." See the article Passions, and the Plate there referred to.

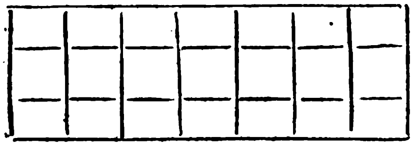
§ 9. *Of drawing Flowers, Fruits, Birds, Beaſts,* &c.

The learner may proceed now to make ſome attempts at drawing flowers, fruits, birds, beaſts, and the like; not only as it will be a more pleaſing employment, but as it is an eaſier taſk, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactneſs and nicer judgment. Very few rules or inſtructions are requiſite upon this head; the beſt thing the learner can do is, to furniſh himſelf with good prints or drawings by way of examples, and with great care and exactneſs to copy them. If it is the figure of a beaſt, begin with the forehead, and draw the noſe, the upper and under jaw, and ſtop at the throat. Then go to the top of the head, and form the ears, neck, back, and continue the line till you have given the full ſhape of the buttock. Then form the breaſt, and mark out the legs and feet, and all the ſmaller parts. And, laſt of all, finiſh it with the proper ſhadows. It is not amiſs, by way of ornament, to give a ſmall ſketch of landſkip; and let it be ſuitable and natural to the place or country of the beaſt you draw. Much the ſame may be ſaid with regard to birds. Of theſe, as well as beaſts and other objects, the learner will find many examples among the plates given in this work.

§ 10. *Of drawing Landſcapes, Buildings,* &c.

Of all the parts of drawing, this is the moſt uſeful and neceſſary, as it is what every man may have occaſion for at one time or another. To be able, on the ſpot, to take the ſketch of a fine building, or a beautiful proſpect; of any curious production of art, or uncommon appearance in nature; is not only a very deſirable accompliſhment, but a very agreeable amuſement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, caſtles, houſes, fortifications, ruins, or whatſoever elſe may preſent itſelf to view on our journeys or travels in our own or foreign countries, may be thus brought home, and preſerved for our future uſe either in buſineſs or converſation. On this part, therefore, more than ordinary pains ſhould be beſtowed.

All drawing conſiſts in nicely meaſuring the diſtances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies is divided into ſquares. For example: Suppoſe or imagine a perpendicular and a horizontal line croſſing each other in the centre of the picture you are drawing from; then ſuppoſe alſo two ſuch lines croſſing your own copy. Obſerve in the original, what parts of the deſign thoſe lines interſect, and let them fall on the ſame parts of the ſuppoſed lines in the copy: We ſay, the ſuppoſed lines; becauſe though engravers, and others who copy with great exactneſs, divide both the copy and original into many ſquares, as below: yet this is a method not to be recommended, as it will be apt to deceive the learner, who will fancy himſelf a tolerable proficient, till he comes to draw after nature, where theſe helps are not to be had, when he will find himſelf miſerably defective and utterly at a loſs.



If he is to draw a landſcape from nature, let him take his ſtation on a riſing ground, where he will have a large horizon; and mark his tablet into three diviſions, downwards from the top to the bottom; and divide in his own mind the landſcape he is to take, into three diviſions alſo. Then let him turn his face directly oppoſite to the midſt of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle diviſion of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, laſtly, do the ſame by what is to be ſeen upon his right hand, laying down every thing exactly both with reſpect to diſtance and proportion. One example is given on plate CLXVIII.

The beſt artiſts of late, in drawing their landſcapes, make them ſhoot away one part lower than another. Thoſe who make their landſcapes mount up higher and higher, as if they ſtood at the bottom of a hill to take the proſpect, commit a great error: the beſt way is to get upon a riſing ground, make the neareſt objects in the piece the higheſt, and thoſe that are farther off to ſhoot away lower and lower till they come almoſt level with the line of the horizon, leſſening every thing proportionably to its diſtance, and obſerving alſo to make the objects fainter and leſs diſtinct the farther they are removed from the eye. He muſt make all his lights and ſhades fall one way, and let every thing have its proper motion: as trees ſhaken by the wind, the ſmall boughs bending more, and the large ones leſs: water agitated by the wind, and daſhing againſt ſhips or boats; or falling from a precipice upon rocks and ſtones, and ſpirting up again into the air, and ſprinkling all about: clouds alſo in the air, now gathered with the winds; now violently condenſed into hail, rain, and the like: Always remembering, that whatever motions are cauſed by the wind muſt be made all to move the ſame way, becauſe the wind can blow but one way at once.

Finally, it muſt be obſerved, that in order to attain any conſiderable proficiency in drawing, a knowledge of PERSPECTIVE is abſolutely neceſſary; ſee that article.

DRAY, a kind of cart uſed by brewers for carrying barrels of beer or ale; alſo a ſledge drawn without wheels.

DRAY, among ſportſmen, denotes ſquirrel neſts built in the tops of trees.

DRAYTON (Michael), an eminent Engliſh poet, born of an ancient family in Warwickſhire in 1563. His propenſity to poetry was extremely ſtrong, even from his infancy; and we find the moſt of his principal poems publiſhed, and himſelf highly diſtinguiſhed as a poet, by the time he was about 30 years of age.—It appears from his poem of Moſes's Birth and Miracles, that he was a ſpectator at Dover of the famous Spaniſh armada, and it is not improbable that he was engaged in ſome military employent there. It is certain, that not only for his merit as a writer, but his valuable qualities as a man, he was held in high eſtimation, and ſtrongly patronized by ſeveral perſonages of conſequence; particularly by Sir Henry Goodere, Sir Walter Aſton, and the Counteſs of Bedford; to the firſt of whom he owns himſelf indebted for great part of his education, and by the ſecond he was for many years ſupported.

His poems are very numerous; and ſo elegant, that his manner has been copied by many modern writers of eminence ſince. Among theſe the moſt celebrated one is the Poly-Albion, a chorographical deſcription of England, with its commodities, antiquities, and curioſities, in metre of 12 ſyllables; which he dedicated to Prince Henry, by whoſe encouragement it was written: and whatever may be thought of the poetry, his deſcriptions are allowed to be exact. He was ſtyled *poet laureat* in his time: which, as Ben Johnſon was then in that office, is to be underſtood in a looſe ſenſe of approbation as an excellent poet; and was beſtowed on others as well as Drayton, without being confined ſtrictly to the office known by that appellation. He died in 1631; and was buried in Weſtminſter-abbey among the poets, where his buſt is to be ſeen, with an epitaph penned by Ben Johnſon.

DREAMS, are all thoſe thoughts which people feel paſſing through their minds, and thoſe imaginary tranſactions in which they often fancy themſelves engaged, when in the ſtate of ſleep.

Scarce any part of nature is leſs open to our obſervation than the human mind in this ſtate. The dreamer himſelf cannot well obſerve the manner in which dreams ariſe or diſappear to him. When he awakes, he cannot recollect the circumſtances of his dreams with ſufficient accuracy. Were we to watch over him with the moſt vigilant attention, we could not perceive with certainty what emotions are excited in his mind, or what thoughts paſs through it, during his ſleep. But though we could aſcertain theſe phenomena, many other difficulties would ſtill remain. What parts of a human being are active, what dormant, when he dreams? Why does not he always dream while aſleep? Or why dreams he at all? Do any circumſtances in our conſtitution, ſituation, and peculiar character, determine the nature of our dreams?

We may lay before our readers ſuch facts as have been aſcertained concerning dreaming, and the moſt plauſible conjectures that have been offered to explain thoſe particulars, about which we can only conjecture, or have at leaſt hitherto obtained nothing more certain than conjecture.

1. In dreaming, we are not conſcious of being aſleep. This is well known from a thouſand circumſtances. When awake, we often recollect our dreams; and we remember on ſuch occaſions, that while thoſe dreams were paſſing through our minds, it never occurred to us that we were ſeparated by ſleep from the active world. We are often obſerved to act and talk in dreaming as if we were buſily engaged in the intercourſe of ſocial life.

2. In dreaming, we do not conſider ourſelves as witneſſing or bearing a part in a fictitious ſcene: we ſeem not to be in a ſimilar ſituation with the actors in a dramatic performance, or the ſpectators before whom they exhibit, but engaged in the buſineſs of real life. All the varieties of thought that paſs through our minds when awake may alſo occur in dreams; all the images which imagination preſents in the former ſtate, ſhe is alſo able to call up in the latter; all the ſame emotions may be excited, and we are often actuated by equal violence of paſſion; none of the tranſactions in which we are capable of engaging while awake is impoſſible in dreams: in ſhort, our range of action and obſervation is equally wide in the one ſtate as in the other; and while dreaming, we are not ſenſible of any diſtinction between our dreams and the events and tranſactions in which we are actually concerned in our intercourſe with the world.

3. It is ſaid, that all men are not liable to dream. Dr Beattie, in a very pleaſing eſſay on this ſubject, relates, that he knew a gentleman who never dreamed except when his health was in a diſordered ſtate: and Locke mentions ſomewhere, that a certain perſon of his acquaintance was a ſtranger to dreaming till the 26th year of his age; and then began to dream in conſequence of having a fever. Theſe inſtances, however, are too few, and we have not been able to obtain more; and, beſides, it does not appear that thoſe perſons had always attended, with the care of a philoſopher making an experiment, to the circumſtances of their ſleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards ſuffer the remembrance of them to ſlip out of the memory. We do not advance this therefore as a certain fact concerning dreaming; we are rather inclined to think it a miſtake.

But though it appears to be by no means certain that any of the human race are through the whole of life abſolute ſtrangers to dreaming; yet it is well known that all men are not equally liable to dream. The ſame perſon dreams more or leſs at different times; and as one perſon may be more expoſed than another to thoſe circumſtances which promote this exerciſe of fancy, one perſon may therefore dream more than another. The ſame diverſity will naturally take place in this as in other accidents to which mankind are in general liable.

4. Though in dreams imagination appears to be free from all reſtraint, and indulges in the moſt wanton freaks; yet it is generally agreed, that the imaginary tranſactions of the dreamer bear always ſome relation to his particular character in the world, his habits of action, and the circumſtances of his life. The lover, we are told, dreams of his miſtreſs; the miſer of his money; the philoſopher renews his reſearches in ſleep often with the ſame pain and fatigue as when awake; and even the merchant, at times, returns to balance his books, and compute the profits of an adventure, when ſlumbering on his pillow. And not only do the more general circumſtances of a perſon's life influence his dreams; his paſſions and habits are nearly the ſame when aſleep as when awake. A perſon whoſe habits of life are virtuous, does not in his dreams plunge into a ſeries of crimes; nor are the vicious reformed when they paſs into this imaginary world. The choleric man finds himſelf offended by ſlight provocations as well in his dreams as in his ordinary intercourſe with the world, and a mild temper continues pacific in ſleep.

5. The character of a perſon's dreams is influenced by his circumſtances when awake in a ſtill more unaccountable manner. Certain dreams uſually ariſe in the mind after a perſon has been in certain ſituations. Dr Beattie relates, that he once, after riding 30 miles in a high wind, paſſed a part of the ſucceeding night in dreams beyond deſcription terrible. The ſtate of a perſon's health, and the manner in which the vital functions are carried on, have a conſiderable influence in determining the character of dreams. After too full a meal, or after eating of an unuſual ſort of food, a perſon has always dreams of a certain nature.

6. In dreaming, the mind for the moſt part carries on no intercourſe through the ſenſes with ſurrounding objects. Touch a perſon gently who is aſleep, he feels not the impreſſion. You may awake him by a ſmart blow; but when the ſtroke is not ſufficiently violent to awake him, he remains inſenſible of it. We ſpeak ſoftly beſide a perſon aſleep without fearing that he overhear us. His eye-lids are ſhut; and even though light ſhould fall upon the eye-ball, yet ſtill his powers of viſion are not awakened to active exertion, unleſs the light be ſo ſtrong as to rouſe him from ſleep. He is inſenſible both to ſweet and to diſagreeable ſmells. It is not eaſy to try whether his organs of taſte retain their activity, without awakening him; yet from analogy it may be preſumed that theſe too are inactive. With reſpect to the circumſtances here enumerated,

it is indifferent whether a perſon be dreaming or buried in deep ſleep.

Yet there is one remarkable fact concerning dreaming which may ſeem to contradict what has been here aſſerted. In dreams, we are liable not only to ſpeak aloud in conſequence of the ſuggeſtions of imagination, but even to get up, and walk about and engage in little enterpriſes, without awaking. Now, as we are in this inſtance ſo active, it ſeems that we cannot be then inſenſible of the preſence of ſurrounding objects. The ſleep-walker is really ſenſible in a certain degree of the preſence of the objects around him; but he does not attend to them with all their circumſtances, nor do they excite in him the ſame emotions as if he were awake. He feels no terror on the brink of a precipice; and in conſequence of being free from fear, he is alſo without danger in ſuch a ſituation unleſs ſuddenly awaked. This is one of the moſt inexplicable phenomena of dreaming.

There is alſo another fact not quite conſonant with what has been above advanced. It is ſaid, that in ſleep a perſon will continue to hear the noiſe of a cataract in the neighbourhood, or regular ſtrokes with a hammer, or any ſimilar ſound ſufficiently loud, and continued uninterruptedly from before the time of his falling aſleep. We know not whether he awakes on the ſudden ceſſation of the noiſe. This fact is aſſerted on ſufficient evidence: it is curious. Even when awake, if very deeply intent on any piece of ſtudy, or cloſely occupied in buſineſs, the ſound of a clock ſtriking in the neighbourhood, or the beating of a drum, will eſcape us unnoticed: and it is therefore the more ſurpriſing that we ſhould thus continue ſenſible to ſounds when aſleep.

7. Not only do a perſon's general character, habits of life, and ſtate of health, influence his dreams; but thoſe concerns in which he has been moſt deeply intereſted during the preceding day, and the views which have ariſen moſt frequently to his imagination, very often afford the ſubjects of his dreams. When I look forward with anxious expectation towards any future event, I am likely to dream either of the diſappointment or the gratification of my wiſhes. Have I been engaged through the day, either in buſineſs or amuſements which I have found exceedingly agreeable, or in a way in which I have been extremely unhappy? either my happineſs or my miſery is likely to be renewed in my dreams.

8. Though dreams have been regarded among almoſt all nations through the world, at leaſt in ſome periods of their hiſtory, as prophetic of future events; yet it does not appear that this popular opinion has been eſtabliſhed on good grounds. Chriſtianity, indeed, teaches us to believe, that the Supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us ſenſible of the reſtraint to which we are thus ſubjected. And, in the ſame manner, no doubt, the ſuggeſtions which ariſe to us in dreams may be produced. The imaginary tranſactions in which we are then engaged, may be ſuch as are actually to occupy us in life; the ſtrange and ſeemingly incoherent appearances which are then preſented to the mind's eye, may allude to ſome events which are to befall ourſelves or others. It is, therefore, by no means impoſſible, or inconſiſtent with the general analogy of nature, that dreams ſhould have a reſpect to futurity. We have no reaſon to regard the dreams which are related in the Holy Scriptures to have been prophetic of future events, as not inſpired by heaven, or to laugh at the idea of a prophetic dream as abſurd or ridiculous.

Yet it would be too much to allow to dreams all that importance which has been aſcribed to them by the prieſthood among heathen nations, or by the vulgar among ourſelves. We know how eaſily ignorance impoſes on itſelf, and what arts impoſture adopts to impoſe upon others. We cannot trace any certain connection between our dreams and thoſe events to which the ſimplicity of the vulgar pretends that they refer. And we cannot, therefore, if diſpoſed to confine our belief to certain or probable truths, join with the vulgar in believing them really referable to futurity.

9. It appears that the brutes are alſo capable of dreaming. The dog is often obſerved to ſtart ſuddenly up in his ſleep, in a manner which cannot be accounted for any other way than by ſuppoſing that he is rouſed by ſome impulſe received in a dream. The ſame thing is obſervable of others of the inferior animals. That they ſhould dream, is not an idea inconſiſtent with what we know of their economy and manners in general. We may, therefore, conſider it as a pretty certain truth, that many, if not all, of the lower ſpecies are liable to dream as well as human beings.

It appears, then, that in dreaming we are not conſcious of being aſleep: that to a perſon dreaming, his dreams ſeem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all *equally* liable to dream: that the nature of a perſon's dreams depends in ſome meaſure on his habits of action, and on the circumſtances of his life: that the ſtate of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a perſon's dreams: that in ſleep and in dreaming, the ſenſes are either abſolutely inactive, or nearly ſo: that ſuch concerns as we have been very deeply intereſted in during the preceding day, are very likely to return upon our minds in dreams in the hours of reſt: that dreams may be rendered prophetic of future events; and therefore, wherever we have ſuch evidence of their having been prophetic as we would accept on any other occaſion, we cannot reaſonably reject the fact on account of its abſurdity; but that they do not appear to have been actually ſuch, in thoſe inſtances in which the ſuperſtition of nations, ignorant of true religion, has repreſented them as referring to futurity, nor in thoſe inſtances in which they are viewed in the ſame light by the vulgar among ourſelves: and, laſtly, that dreaming is not a phenomenon peculiar to human nature, but common to mankind with the brutes.

We know of no other facts that have been fully aſcertained concerning *dreaming*. But we are by no means ſufficiently acquainted with this important phenomenon in the hiſtory of mind. We cannot tell by what laws of our conſtitution we are thus liable to be ſo frequently engaged in imaginary tranſactions, nor what are the particular means by which the deluſion is accompliſhed. The deluſion is indeed remarkably ſtrong. One will ſometimes have a book preſented to him in a dream, and fancy that he reads, and actually enter into the nature of the imaginary compoſition before him, and even remember, after he awakes, what he knows, that he only fancied himſelf reading (A). Can this be deluſion? If deluſion, how or for what purpoſes is it produced? The mind, it would appear, does not, in ſleep, become inactive like the body; or at leaſt is not always inactive while we are aſleep. When we do not dream, the mind muſt either be inactive, or the connection between the mind and the body muſt be conſidered as in ſome manner ſuſpended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the ſame manner as when we are awake. It ſeems to be clouded or bewildered, in conſequence of being deprived for a time of the ſervice of the ſenſes. Imagination becomes more active and more capricious: and all the other powers, eſpecially judgment and memory, become diſordered and irregular in their operation.

Various theories have been propoſed to explain what appears here moſt inexplicable. The ingenious Mr Baxter, in his Treatiſe on the Immateriality of the Human Soul, endeavours to prove that dreams are produced by the agency of ſome ſpiritual beings, who either amuſe or employ themſelves ſeriouſly in engaging mankind in all thoſe imaginary tranſactions with which they are employed in dreaming. This theory, however, is far from being plauſible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unſupported by any analogy. It creates difficulties ſtill more inexplicable than thoſe which it has been propoſed to remove. Till it appear that our dreams cannot poſſibly be produced without the interference of other ſpiritual agents, poſſeſſing ſuch influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions, we cannot reaſonably refer them to ſuch a cauſe. Beſides, from the facts which have been ſtated as well known concerning dreams, it appears that their nature depends both on the ſtate of the human body and on that of the mind. But were they owing to the agency of other ſpiritual beings, how could they be influenced by the ſtate of the body? Thoſe muſt be a *curious* ſet of ſpiritual beings who depend in ſuch a manner on the ſtate of our corporeal frame. Better not to allow them exiſtence at all, than to place them in ſuch a dependance.

Wolfius, and after him M. Formey, have ſuppoſed, that dreams never ariſe in the mind, except in conſequence of ſome of the organs of ſenſation having been previouſly excited. Either the ear or the eye, or the organs of touching, taſting, or ſmelling, communicate information, ſomehow, in a tacit, ſecret manner; and thus partly rouſe its faculties from the lethargy in which they are buried in ſleep, and engage them in a ſeries of confuſed and imperfect exertions. But what paſſes in dreams is ſo very different from all that we do when awake, that it is impoſſible for the dreamer himſelf to diſtinguiſh, whether his powers of ſenſation *perform* any part on the occaſion. It is not neceſſary that imagination be always excited by ſenſation. Fancy, even when we are awake, often wanders from the preſent ſcene. *Abſence of mind* is incident to the ſtudious: the poet and the mathematician many times forget where they are. We cannot diſcover from any thing that a perſon in dreaming diſplays to the obſervation of others, that his organs of ſenſation take a part in the imaginary tranſactions in which he is employed. In thoſe inſtances, indeed, in which perſons aſleep are ſaid to hear ſounds; the ſounds which they hear are ſaid alſo to influence, in ſome manner, the nature of their dreams. But ſuch inſtances are ſingular. Since then it appears that the perſon who dreams is himſelf incapable of diſtinguiſhing either during his dreams, or by recollection when awake, whether any new impreſſions are communicated to him in that ſtate by his organs of ſenſation; that even by watching over him, and comparing our obſervations of his circumſtances and emotions, in his dreams, with what he recollects of them after awaking, we cannot, except in one or two ſingular inſtances, aſcertain this fact; and that the mind is not incapable of acting while the organs of ſenſation are at reſt, and on many occaſions refuſes to liſten to the information which they convey; we may, without heſitation, conclude, that the theory of Wolfius and Formey has been too haſtily and incautiouſly advanced.

Other phyſiologiſts tell us, that the mind, when we dream, is in a ſtate of *delirium*. Sleep, they ſay, is attended with what is called a *collapſe* of the brain; during which either the whole or a part of the nerves of which it conſiſts, are in a ſtate in which they cannot carry on the uſual intercourſe between the mind and the organs of ſenſation. When the whole of the brain is in this ſtate, we become entirely unconſcious of exiſtence, and the mind ſinks into inactivity: when only a part of the brain is *collapſed*, as they term it, we are then neither aſleep nor awake, but in a ſort of delirium between the two. This theory, like the laſt mentioned, ſuppoſes the mind incapable of acting without the help of ſenſation: it ſuppoſes that we know the nature of a ſtate of which we cannot aſcertain the phenomena; it alſo contradicts a known fact, in repreſenting dreams as confuſed images of things around us, not fanciful combinations of things not exiſting together in nature or in human life. We muſt treat it likewiſe, therefore, as a baſeleſs fabric.

In the laſt edition of this work, a theory ſomewhat different from any of the foregoing was advanced on this ſubject. It was obſerved, that the nervous fluid, which is allowed to be ſecreted from the blood by the brain, appears to be likewiſe abſorbed from the blood by the extremities of the nerves. It was farther advanced, that as this fluid was to be conſidered as the principle of ſenſibility; therefore, in all caſes in which a ſufficient ſupply of it was not abſorbed from the blood by the extremities of the nerves, the parts of the body to which thoſe nerves belonged, muſt be, in ſome degree, deprived of ſenſation. From theſe poſitions it was inferred, that as long as impreſſions of external objects continue to communicate a certain motion from the ſentient extremities of the nerves to the brain,—ſo long we continue awake; and that, when

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(A) The writer of this article has been told by a reſpectable old gentleman of his acquaintance, ſince dead, that he had frequently dreams of this nature. The fact may therefore be conſidered as unqueſtionable.

there is a deficiency of this vital fluid in the extremities of the nerves, or when from any other cauſe it ceaſes to communicate to the brain the peculiar motion alluded to, we muſt naturally fall *aſleep*, and become inſenſible of our exiſtence. It followed of conſequence, that, in ſleep, the nervous fluid between the extreme parts of the nerves and the brain muſt either be at reſt, or be deficient, or be prevented by ſome means from paſſing into the brain: and it was concluded, that whenever irregular motions of this fluid were occaſioned by any internal cauſe, *dreaming* was produced.—In this manner it appeared that we might be deceived with regard to the operation of any of the ſenſes;—ſo as to fancy that we ſaw objects not actually before us,—to hear imaginary ſounds,—to taſte,—to feel, and to ſmell in imagination. The inſtances of viſions which will ſometimes ariſe, and as it were ſwim before us when awake, though our eyes be ſhut, *tinnitus aurium*, which is often a ſymptom in nervous diſeaſes, and the ſtrange feelings in the caſe of the amputated limb, were produced in proof of this theory, and applied ſo as to confirm it.

We are ſtill of opinion, that this theory is more plauſible, and goes farther towards explaining the nature of *dreaming*, and the manner in which *dreams* are produced, than any other with which we are acquainted. But it muſt be confeſſed, upon a review, that even in it there is too much ſuppoſition. The nature of the nervous fluid is but imperfectly known, and even its exiſtence not very fully aſcertained. The nature of the connection by which the ſoul and body are united, ſeems to be almoſt beyond our comprehenſion. And till we can apply experiment and obſervation in a better manner to this branch of phyſiology, it muſt undoubtedly remain unknown. To ſomething myſterious in the nature of that connection, the deluſion produced in dreams is in all probability owing.

Amid this uncertainty with reſpect to the manner in which our powers of mind and body perform their functions in dreaming; it is pleaſing to find that we can, however, apply to uſeful purpoſes the imperfect knowledge which we have been able to acquire concerning this ſeries of phenomena. Our dreams are affected by the ſtate of our health, by the manner in which we have paſſed the preceding day, by our general habits of life, by the hopes which we moſt fondly indulge, and the fears which prevail moſt over our fortitude when we are awake. From recollecting our dreams, therefore, we may learn to correct many improprieties in our conduct; to refrain from bodily exerciſes, or from meats and drinks that have unfavourable effects on our conſtitution; to reſiſt, in due time, evil habits that are ſtealing upon us; and to guard againſt hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Inſtead of thinking what our dreams may forebode, we may with much better reaſon reflect by what they have been occaſioned, and look back to thoſe circumſtances in our paſt life to which they are owing. The ſleep of innocence and health is ſound and refreſhing; their dreams delightful and pleaſing. A diſtempered body, and a polluted or perturbed mind, are haunted in ſleep with frightful, impure, and unpleaſing dreams.

Some very beautiful fables have been written both by ancients and moderns in the form of dreams. The *Somnium Scipionis* is one of the fineſt of Cicero's compoſitions. He who ſhall carefully peruſe this piece with Macrobius's commentary upon it, will acquire from them conſiderable knowledge of ancient philoſophy. In the periodical publications, which have diffuſed ſo much elegant and uſeful knowledge through Britain, the Tatlers, Spectators, Guardians, &c. we find a number of excellent dreams. Addiſon excelled in this way of writing. The public are now leſs partial to this ſpecies of compoſition than they formerly were.

Dr Beattie, in his valuable eſſay on the ſubject of dreaming, quotes a very fine one from the Tatler, and gives it due praiſe.

The reader who is diſpoſed to ſpeculate farther on this ſubject, may conſult Beattie's Eſſays, Hartley on Man, and the principal writers on phyſiology.

DRELINCOURT (Charles), miniſter of the reformed church at Paris, was born at Sedan in 1595, where his father enjoyed a conſiderable poſt. He had all the qualifications that compoſe a reſpectable clergyman; and though he defended the Proteſtant cauſe againſt the Romiſh religion, was much eſteemed even among the Catholics. He is beſt known in England by his Conſolations againſt the Fears of Death, which work was tranſlated, and is often printed. He married the daughter of a rich merchant at Paris, by whom he had 16 children. His third ſon, profeſſor of phyſic at Leyden, was phyſician to the Prince and Princeſs of Orange before their acceſſion to the crown of England. Bayle has given him a high character. Mr Drelincourt died in 1660.

DRENCH, among farriers, a phyſical potion for horſes. The ingredients for this purpoſe are to be beat coarſely, and either mingled with a decoction or with wine. Then let all infuſe about a quarter of an hour, and give it to the horſe with a horn after he has been tied up two hours to the rack.

DREPANE, the ancient name of Corcyra, from the curvity of its figure, reſembling a ſickle.

Drepane, *Drepanum*, (anc. geog.), a town of Bithynia, ſituated between the Sinus Aſtacenus and the Boſphorus Thracius; called *Helenopolis* by Conſtantine, in honour of his mother Nicephorus Calliſtus.

DREPANUM (anc. geog.), the promontory Rhium in Achaia; ſo called becauſe bent in the manner of a ſickle.—Another *Drepanum* on the Arabic Gulf, on the ſide of Egypt. A third on the north ſide of Crete, ſituated between Cydonia and the Sinus Amphimallus. A fourth on the weſt ſide of Cyprus. A fifth, a promontory of Cyrenaica, on the Mediterranean.

Drepanum, *-i*, or *Drepana*, *-orum*, a town and port on the weſt ſide of Sicily, and to the weſt of mount Eryx: *Drepanitani* the people. Now *Trepano*, a city and port-town on the weſtmoſt point of Sicily. E. Long. 12. 8. Lat. 38. 0.

DRESDEN, the capital city of the electorate of Saxony in Germany. It is ſeated on the river Elbe, which divides it into two parts. One part is called *Old Dreſden*, and the other the *New Town*, in the German language *New Stadt*. They are joined together by a ſtone bridge, ſupported by 19 piers, and 630 paces in length. As this bridge was too narrow for the crowds of people that were continually paſſing and repaſſing, King Auguſtus, in 1730, cauſed two walks for foot-paſſengers to be built, one on each ſide, in a very wonderful manner; the one for thoſe that go into the city, and the other for thoſe that return back. Theſe are bordered with iron palliſadoes of curious workmanſhip. Dreſden is ſurrounded by ſtrong and handſome fortifications; and contains, according to the lateſt accounts, 110,000 inhabitants.

All the buildings of this city are conſtructed with ſquare free ſtone, and are almoſt all of the ſame height. They have ſtone from the neighbourhood of Pirna, about ten miles from this city, which is readily brought down the Elbe. In general the houſes are high and ſtrong; the ſtreets wide, ſtraight, well paved, clean, and well illuminated in the night; and there are large ſquares, diſpoſed in ſuch a manner, that Dreſden may paſs for one of the handſomeſt cities in the world. The elector's palace is a magnificent ſtructure, and abounds in many valuable curioſities both of nature and art. The collection of pictures is reckoned one of the fineſt that exiſts, and is valued at 500,000 l.

Above 700 men are here conſtantly employed in the porcelain manufacture, the annual expence of which is eſtimated at no more than 80,000 crowns; and the manufacture yields to the king 200,000 crowns yearly, beſides the magnificent preſents which he occaſionally makes, and the large quantity reſerved for the uſe of his houſehold.

The other moſt conſiderable article of trade is ſilver, of which the mines near Fridburg produce every 15 days near the value of 20,000 dollars. The metal is brought into the city in ingots, where it is immediately coined and delivered to the proprietors.

The court of Dreſden is one of the moſt remarkable in Europe for ſplendor and profuſion. Six thouſand five hundred ducats are yearly allowed for comfits and ſimilar articles, which is near twice as much as the king of Pruſſia allows for the whole expence of his table. The revenues of the elector are eſtimated at about 1,576,000 l.; which ariſe from the taxes on lands, and a capitation of ſix dollars on all males as ſoon as they commence an apprenticeſhip or begin to work. People of a higher rank are taxed according to their claſs, and are liable to be called to account if they aſſume not an exterior appearance correſpondent to the extent of their fortune. Every foreigner pays capitation after reſiding ſix months in the country. The Jews are taxed at 50, their wives at 30, and their children at 20 dollars. There is alſo an exciſe on all eatables and liquors; and 10 *per cent.* is levied out of the incomes of the people.

Though this city lies in a low ſituation, yet it hath agreeable proſpects. It is ſupplied with a prodigious quantity of proviſions, not only out of the neighbourhood, but from Bohemia, which are brought every market-day, which is once a-week. E. Long. 13. 34. N. Lat. 51. 12.

DRESSING of HEMP and FLAX. See *FLAX-Dreſſing*.

DRESSING *of Meats*, the preparing them for food by means of culinary fire.

The deſign of dreſſing is to looſen the compages or texture of the fleſh, and diſpoſe it for diſſolution and digeſtion in the ſtomach. Fleſh not being a proper food without dreſſing, is alleged as an argument that man was not intended by nature for a carnivorous animal.

The uſual operations are roaſting, boiling, and ſtewing.—In roaſting, it is obſerved, meat will bear a much greater and longer heat than either in boiling or ſtewing; and in boiling, greater and longer than in ſtewing. The reaſon is, that roaſting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and ſo gradually let out part of the rarefied included air, by which means the internal ſuccuſſions, on which the diſſolution depends, are much weakened and abated. Boiling being performed in water, the preſſure is greater, and conſequently the ſuccuſſions to lift up the weight are proportionably ſtrong; by which means the coction is haſtened: and even in this way there are great differences; for the greater the weight of water, the ſooner is the buſineſs done.

In ſtewing, though the heat be infinitely ſhort of what is employed in the other ways, the operation is much more quick, becauſe performed in a cloſe veſſel, and full; by which means the ſuccuſſions are oftener repeated, and more ſtrongly reverberated. Hence the force of Papin's digeſtor; and hence an illuſtration of the operation of digeſtion.

Boiling, Dr Cheyne obſerves, draws more of the rank ſtrong juices from meat, and leaves it leſs nutritive, more diluted, lighter, and eaſier of digeſtion: roaſting, on the other hand, leaves it fuller of the ſtrong nutritive juices, harder to digeſt, and needing more dilution. Strong, grown, and adult animal food, therefore, ſhould be boiled; and the younger and tenderer roaſted.

DRESSING, in ſurgery, the treatment of a wound or any diſordered part. The apparatus of dreſſing conſiſts of doſſils, tents, plaſters, compreſſes, bandages, bands, ligatures, and ſtrings. See SURGERY.

DREXELIUS (Jeremiah), a Jeſuit celebrated for his piety and writings, was born at Auſburg, and became preacher in ordinary to the elector of Bavaria. He wrote ſeveral pious and practical pieces, which have been printed together in two volumes folio; and died in 1638.

DREVET (Peter) the Younger, an eminent French engraver, was a member of the royal academy of painting and ſculpture; and died at Paris in 1739, at 42 years of age. His portraits are neat and elegant; but laboured to the laſt degree. He particularly excels in repreſenting lace, ſilk, fur, velvet, and other ornamental parts of dreſs.—His father was excellent in the ſame art; and had inſtructed, but was ſurpaſſed by the ſon. The younger Drevet did not confine himſelf to portraits. We have ſeveral hiſtorical prints by him, which in point of neatneſs and exquiſite workmanſhip are ſcarcely to be equalled. His moſt eſteemed and beſt hiſtorical print is very valuable; but the firſt impreſſions of it are rarely to be met with: it is, The Preſentation of Chriſt in the Temple; a very large plate, lengthwiſe, from Louis de Bologna. The following deſerve alſo to be particularized. The Meeting of Abraham's Servant with Rebecca at the

Well; a large upright plate, from An. Coypel: and Abraham, with his Son Iſaac on the Altar, the ſame, from the ſame, dated 1707; the firſt impreſſions of which are before the work upon the right thigh of Iſaac was altered, the curved lines from the button almoſt down to the knee being in thoſe impreſſions arched downwards, but in poſterior ones arched upwards. Among his portraits, the two following are juſtly held in the higheſt eſtimation: M. Boſſuet Biſhop of Meaux; a whole-length figure ſtanding, a middling ſized upright plate, from Rigaud: and Samuel Bernard; a whole-length figure ſitting in a chair, a large upright plate. The firſt impreſſions of the laſt are, before the words *Conſeiller d'Etat* were inſerted upon the plate.

DREUX, a town in the Iſle of France, remarkable for its antiquities; and for the battle which was fought in December 1562 between the Papiſts and the Proteſtants, wherein the former gained the victory. Some think it took its name from the prieſts of Gaul, called the *Druids*, in the times of Paganiſm. It conſiſts of two pariſhes, St Stephen's and Notre Dame, called the *great church*, which is pretty well built. It is ſeated on the river Blaiſe, at the foot of a mountain, on which is a ruined caſtle. E. Long. 1. 27. N. Lat. 48. 44.

DRIEPER, or DNIEPER, a river of Ruſſia, which riſes in the foreſt of Volkonſki, near the ſource of the Volga, about 100 miles from Smolenſko. It paſſes by Smolenſko and Mohilef, ſeparates the Ukraine from Poland, flows by Kiof, and falls into the Black Sea between Otzakof and Kinburn. By the acquiſition of the province of Mohilef, its whole courſe is now included within the Ruſſian territories. It begins to be navigable at a little diſtance above Smolenſko, though in ſome ſeaſons of the year it is ſo ſhallow near the town, that the goods muſt be tranſported upon rafts and ſmall flat-bottomed boats.

DRIFT, in navigation, the angle which the line of a ſhip's motion makes with the neareſt meridian, when ſhe drives with her ſide to the wind and waves, and is not governed by the power of the helm: it alſo implies the diſtance which the ſhip drives on that line.

A ſhip's way is only called *drift* in a ſtorm; and then when it blows ſo vehemently as to prevent her from carrying any ſail, or at leaſt reſtrains her to ſuch a portion of ſail as may be neceſſary to keep her ſufficiently inclined to one ſide, that ſhe may not be diſmaſted by her violent labouring produced by the turbulence of the ſea.

DRIFT, in mining, a paſſage cut out under the earth betwixt ſhaft and ſhaft, or turn and turn; or a paſſage or way wrought under the earth to the end of a meer of ground, or part of a meer.

Drift-Sail, a ſail uſed under water, veered out right a-head by ſheets, as other ſails are. It ſerves to keep the ſhip's head right upon the ſea in a ſtorm, and to hinder her driving too faſt in a current.

DRILL, in mechanics, a ſmall inſtrument for making ſuch holes as punches will not conveniently ſerve for. Drills are of various ſizes, and are chiefly uſed by ſmiths and turners.

DRILL, or *Drill-Box*, a name given to an inſtrument for ſowing land in the new method of horſe-hoeing huſbandry. See AGRICULTURE.

Drill-Sowing, a method of ſowing grain or ſeed of any kind, ſo that it may all be at a proper depth in the earth, which is neceſſary to its producing healthful and vigorous plants. For this purpoſe a variety of drill-ploughs have been invented and recommended; but from the expence attending the purchaſe, and the extreme complication of their ſtructure, there is not an inſtrument of that kind, as yet diſcovered, that is likely to be brought into general uſe. This method, however, is greatly recommended in the Georgical Eſſays; where we have the following obſervations and experiments.—"Grain ſown by the hand, and covered by the harrows, is placed at unequal depths; the ſeeds conſequently ſprout at different times, and produce an unequal crop. When barley is ſown late, and a drought ſucceeds, the grain that was buried in the moiſture of the earth ſoon appears, while ſuch as was left near the ſurface lies baking in the heat of the ſun, and does not vegetate till plentiful rains have moiſtened the ſoil. Hence an inequality of the crop, an accident to which barley is particularly liable. The ſame obſervation, but in a more ſtriking manner, may be made upon the ſowing of turnips. It frequently happens that the huſbandman is obliged to ſow his ſeed in very dry weather, in hopes that rain will ſoon follow; and either rolls or covers it with a buſh-harrow. We will ſuppoſe, that, contrary to his expectations, the dry weather continues. The ſeed, being near the ſurface, cannot ſprout without rain. The huſbandman is mortified at his diſappointment, but is ſoon ſatisfied and made eaſy by a perfect acquieſcence in what he thinks is the will of Providence. The ſcourge that he feels muſt not be placed to the diſpenſation of Providence, but has its ſource in the ignorance of the man himſelf. Had he judiciouſly buried the ſeed in the moiſt part of the ſoil with the drill plough, or harrowed it well with the common harrow, his ſeed would have vegetated in due ſeaſon, and bountifully repaid him for his toil.

"In the year 1769, a 15 acre cloſe was prepared for turnips. The land was in fine condition as to lightneſs, and had been well manured. On the 24th of June, 14 acres were ſown with turnip-ſeed broad-caſt, and harrowed in with a buſh-harrow. The remaining acre was ſowed the ſame day with the drill-plough, allowing 14 inches between the rows, and the ſhares being ſet near two inches deep. At the time of ſowing, the land was extremely dry, and the drought continued from the time of ſowing to the 5th of July: ſo that the broad-caſt did not make its appearance till about the 8th of that month, at which time the drill turnips were in rough leaf, having appeared upon the ſurface the ſixth day after ſowing.

"In the drieſt ſeaſons, at the depth of two inches or leſs, we are ſure of finding a ſufficiency of moiſture to make the ſeed germinate. When that is once accompliſhed, a ſmall degree of moiſture will carry on the work of vegetation, and bring the tender plants forward to the ſurface. When extreme dry weather obliges the broad-caſt farmer to ſow late, he has no opportunity of ſowing a ſecond time if the fly ſhould get into the field. The drill ſecures him in ſome degree againſt that misfortune, by giving him a full command over the ſeaſons.

"The excellence of the drill-plough is not confined to turnip-ſeed; it is an uſeful inſtrument for ſowing all kinds of grain. By burying the ſeeds at an equal depth, it ſecures an equal crop in all circumſtances of the weather. But this is not the only conſideration to the cultivator. It ſaves near one half of his ſeed, which is an object of importance to the tillage farmer.

“ In the ſpring of the year 1769, an acre of barley was ſowed in equidiſtant rows with the drill-plough, in a field which was ſown with the ſame grain and upon the ſame day broad-caſt.—The broad-caſt took three buſhels per acre; the drill required only ſix pecks. The drills were eight inches aſunder, and the ſeed was lodged about two inches within the ſoil. The drill acre was finiſhed within the hour, and the moſt diſtinguiſhing eye could not diſcover a ſingle grain upon the ſurface.

“ In the courſe of growing, the drill barley ſeemed greener and bore a broader leaf than the broad-caſt. When the ears were formed throughout the field, the ear of the drill barley was plainly diſtinguiſhed to be near half an inch longer than the broad-caſt, and the grains ſeemed fuller and better fed.

“ Drill-ſowing, however, though it may be recommended as a moſt rational and judicious practice, has many difficulties to overcome, and perhaps will never be brought into general uſe. A proper inſtrument is wanting that would come cheap to the farmer, and have the requiſites of ſtrength and ſimplicity to recommend it. The preſent inſtruments cannot by any means be put into the hands of common ſervants. Should we ever be ſo happy as to ſee this objection removed, it is probable that all kinds of grain will be cultivated in drills. Corn growing in that manner has a freer enjoyment of air, and the farmer has an opportunity of hand-hoeing and weeding without injury to the growing crop. This is an object of the utmoſt conſequence in the cultivation of beans and winter corn.

“ The beſt inſtrument for drilling of grain is the invention of the ingenious Mr Craick, and made by Mr Crichton coach-maker in Edinburgh. It works with four coulters, and the price is 12l. With it, one man, a horſe, and a boy, can eaſily ſow four acres a-day.”

DRILLING is popularly uſed for exerciſing ſoldiers. The word is derived from the French *drille*, which ſignifies a *raw ſoldier*.

DRIMYS, in botany: A genus changed by Murray, in the 14th edit. of *Syſt. Veget.* to WINTERA; which ſee.

DRINK, a part of our ordinary food in a liquid form. See FOOD.

The general uſe of drink is, to ſupply fluid; facilitate ſolution; in conſequence of that, to expede the evacuation of the ſtomach, and promote the progreſs of the aliment through the inteſtines: for, by the contraction of the longitudinal fibres of the ſtomach, the pylorus is drawn up, and nothing but fluid can paſs; which, by its bulk, makes a hurried progreſs through the inteſtines, and ſo determines a greater excretion by ſtool, as leſs then can be abſorbed by the lacteals. Hence a large quantity of common water has been found purgative; and, *cæteris paribus*, that aliment which is accompanied with the largeſt proportion of drink, makes the largeſt evacuation by ſtool. Here a queſtion has ariſen, about where the feculent part of the aliment is firſt remarkably collected. It is commonly thought to be in the great guts: but undoubtedly it often begins in the lower part of the ileum, eſpecially when the drink is in ſmall proportion, and when the progreſs of the aliment is ſlow; for when the contents of the guts are very fluid, they are quickly puſhed on, and reach the great guts before they depoſit any feculency. Another effect of drink is, to facilitate the mixture of the lymph, refluent from every part of the ſyſtem, with the chyle. In the blood-veſſels, where all muſt be kept fluid in order to proper mixture, drink increaſes the fluidity, and gives tenſion, by its bulk, without concomitant acrimony or too much elaſticity, and ſo ſtrength and oſcillatory motion: hence drink contributes to ſanguification, as ſometimes food gives too denſe a nutriment to be acted upon by the ſolids; and hence alſo we can ſee how drink promotes the ſecretions. Theſe are the effects of drink in general; but what has been ſaid muſt be taken with ſome limitations; for the more liquid the food, it is ſooner evacuated, and leſs nouriſhment is extracted. Hence drink is, in ſome degree, oppoſed to nouriſhment; and ſo, *cæteris paribus*, thoſe who uſe leaſt drink are moſt nouriſhed.

All the effects of drink above mentioned are produced by ſimple water; and it may be ſaid, that other liquors are fit for drink in proportion to the water they contain. Water, when uſed as drink, is often impregnated with vegetable and farinaceous ſubſtances; but, as drinks, theſe impregnations are of little conſequence: they add, indeed, a little nouriſhment; but this is not to be regarded in a healthy ſtate. Sometimes we impregnate water with the *fructus acido-dulces*; and then, indeed, it acquires other qualities, of conſiderable uſe in the animal economy. All drinks, however, may be reduced to two heads: firſt, pure water, or where the additional ſubſtance gives no additional virtue; ſecondly, the *fermentatæ*. Of the firſt we have already ſpoken; and the latter have not only the qualities of the firſt, but alſo qualities peculiar to themſelves.

Fermented liquors are more or leſs poignant to the taſte, and better calculated to quench thirſt. Thirſt may be owing to various cauſes: firſt, to defect of fluid in the ſyſtem, which occaſions a ſcanty ſecretion in the mouth, fauces, and ſtomach; the dryneſs of the mouth and fauces will alſo in this caſe be increaſed, by their continual expoſure to the perpetual flux and reflux of the evaporating air. Secondly, thirſt depends on a large proportion of ſolid viſcid food: thirdly, on an alkaleſcent aliment, eſpecially if it has attained any thing of the putrefactive taint: fourthly, on the heat of the ſyſtem; but this ſeems to operate in the ſame manner as the firſt cauſe, giving a ſenſe of dryneſs from its diſſipation of the fluids. The fermented liquors are peculiarly adapted for obviating all theſe cauſes; ſtimulating the mouth, fauces, and ſtomach, to throw out the ſaliva and gaſtric liquor by their poignancy: by their aceſcency they are fitted to deſtroy alkaleſcent acrimony, to quench thirſt from that cauſe: by their fluidity they dilute viſcid food; though here, indeed, they anſwer no better than common water. In two ways they promote the evacuation by ſtool, and progreſs through the inteſtines: firſt, by their fluidity and bulk; ſecondly, by their aceſcency, which, uniting with the bile, forms the peculiar ſtimulus formerly mentioned. Carried into the blood-veſſels, in ſo far as they retain any of the ſaline nature, they ſtimulate the excretories, and promote urine and ſweet; correcting thus alkaleſcency, not only by mixture, but diſſipation of the degenerated fluids.

Many phyſicians, in treating of fermented liquors, have only mentioned theſe qualities, rejecting their nutritious virtue, which certainly ought to be taken in; though by expediting the evacuation by ſtool they make leſs of the nutritious parts of the aliment to be taken up, and by ſtimulating the excretories make theſe nutritious parts to be for a ſhorter time in the ſyſtem. All theſe and many more effects ariſe from fermented liquors. Their aceſcency ſometimes promotes the diſeaſe of aceſcency, by increaſing that of vegetables, acting as a ferment, and ſo producing flatulency, purging, cholera, &c.: ſo that, with vegetable aliment, as little drink is neceſſary, the moſt innocent is pure water; and it is only with animal food that fermented liquors are neceſſary. In warmer climates, *fermentatæ* would ſeem neceſſary to obviate alkaleſcency and heat. But it ſhould be conſidered, that though fermented liquors contain an acid, yet they alſo contain alcohol; which, though it adds ſtimulus to the ſtomach, yet is extremely hurtful in the warmer climates, and wherever alkaleſcency prevails in the ſyſtem. Nature, in theſe climates, has given men an appetite for water impregnated with acid fruits, *e. g.* ſherbet; but the uſe of this needs caution, as in theſe countries they are apt to ſhun animal food, uſing too much of the vegetable, and often thus cauſing dangerous refrigerations, choleras, diarrhœas, &c.

Of varieties of fermented liquors. We ſhall only mention here the chief heads on which theſe varieties depend. Firſt, they are owing to the quality of the ſubject, as more or leſs viſcid; and to its capacity alſo of undergoing an active fermentation, although perhaps the more viſcid be more nutritious. Hence the difference between ales and wines; by the firſt meaning fermented liquors from *farinacea*, by the ſecond from the fruits of plants. It depends, ſecondly, on the acerbity, acidity, nature, and maturation, of the fruit. Thirdly, the variety depends on the conduct of the fermentation. In general, fermentation is progreſſive, being at firſt active and rapid, detaching the fixed air or *gas ſylveſtre*, at the ſame time acquiring more acid than before. Theſe qualities of flatulency and acidity remain for ſome time; but as the fermentation goes on, the liquor becomes more perfect, no air is detached, and alcohol is produced; ſo that fermented liquors differ according to the progreſs of the fermentation, and have different effects on the ſyſtem. When fermentation is ſtopped before it comes to maturity, though naturally it proceeds in this way, yet by addition of new ferment it may again be renewed with a turbid inteſtine motion.

DRIVERS, among ſportſmen, a machine for driving pheaſant-powts, conſiſting of good ſtrong ozier wands, ſuch as the baſket-makers uſe; theſe are to be ſet in a handle, and twiſted or bound with ſmall oziers in two or three places. With this inſtrument the ſportſman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among ſportſmen, a method of taking pheaſant-powts. It is thus: The ſportſman finds out the haunts of theſe birds; and having fixed his nets there, he calls upon them together by a pheaſant-call, imitating the voice of the dam; after this he makes a noiſe with his driver, which will make them run a little way forward in a cluſter; and this he is to repeat till he has made ſure of them, which an expert ſportſman never fails to do, by driving them into his nets.

DRIVING, in metallurgy, is ſaid of ſilver, when, in the operation of refining, the lead being burnt away, the remaining copper riſes upon its ſurface in red fiery bubbles.

DRIVING, in the ſea-language, is ſaid of a ſhip, when an anchor being let fall will not hold her faſt, nor prevent her ſailing away with the wind or tide. The beſt help in this caſe is to let fall more anchors, or to veer out more cable; for the more cable ſhe has out, the ſafer ſhe rides. When a ſhip is a-hull or a-try, they ſay ſhe drives to leeward.

DROGHEDA, by the Engliſh called *Tredah*, a town of Ireland, in the province of Leinſter and county of Lowth, and ſituated on a bay of the ſame name, in W. Long. 6. 17. N. Lat. 53. 45. It was formerly very remarkable for its ſituation and ſtrength. In conſequence of this it was much diſtinguiſhed by the old Engliſh monarchs. Edward II. granted it a market and fair; and to theſe were added other great privileges in ſucceeding ages, particularly the right of coinage. It was bravely defended againſt the rebels in 1641. After the ceſſation of arms it was taken by the duke of Ormond and the earl of Inchiquin; but was retaken by Cromwell in 1649. At this time it ſuffered ſo much, that for a long time after it remained almoſt in ruins. The buildings were exceedingly ſhattered; and the town being taken by ſtorm, not only the garriſon, but the inhabitants, men, women, and children, were moſtly put to the ſword. By degrees, however, it recovered, and is at preſent a large and populous place. It is a town and county; and as ſuch ſends two repreſentatives to parliament. It has a great ſhare of inland trade, and an advantageous commerce with England: and though the port is but indifferent, and narrow at its entrance, with a bar over which ſhips of burden cannot paſs but at high water, yet a great deal of buſineſs is done; ſo that, from a low and declining port, it is now become rich and thriving.

Drogheda is perhaps one of the ſtrongeſt inſtances that can be mentioned of the ineſtimable benefit of a river in any degree navigable: for though the Boyne is not capable of carrying veſſels bigger than barges, or pretty large boats, yet the conveniency that this affords of conveying coals by water-carriage through a great extent of country, introduced a correſpondence between this place and Whitehaven in Cumberland, to which the revival of its commerce has been in a great meaſure owing.

DROITWITCH, a town of Worceſterſhire in England, noted for excellent white ſalt made from the ſalt ſprings in its neighbourhood. It ſends two members to parliament. W. Long. 2. 16. N. Lat. 52. 20.

DROMEDARY. See CAMELUS.

DROMORE, a town of Ireland, in the county of Down. It is a very ancient town, and the ſeat of a biſhopric. The ſee was founded by St Colman in the 6th century. It was refounded by King James I. who, by his charters (now preſerved in the Rolls-office), granted it very great and uncommon privileges. Among other marks of royal favour, he diſtinguiſhes the biſhops of this ſee by the ſtyle of "A. B. by Divine Providence biſhop of Dromore:" whereas all other biſhops in Ireland, except thoſe of Meath and Kildare, are ſtyled, "by Divine Permiſſion." This ſee, although the leaſt in its extent, is ſo complete and perfect in its endowment and juriſdiction, that it need not envy the greateſt and moſt opulent.

DRONE, a kind of large bees which make their appearance in hives about the month of May, but never work nor prepare any honey; and are at laſt all killed by the reſt. Under the article Bee, nº 20 *et ſeq.* we have given an account of the experiments of Meſſrs Debraw and Schirach concerning theſe animals: but ſince that article was printed, a Treatiſe upon Bees and their Management has appeared by Mr Bonner near Berwick on Tweed, who has made the management of bees his ſtudy for a great number of years, and who diſſents from the opinions of the above mentioned gentlemen for the following reaſons, which we ſhall give in his own words. Having mentioned the opinions of Mr Debraw concerning the little drones mentioned in the article above mentioned, he proceeds thus:

"1. Can it be thought that the prying eyes of multitudes in many generations ſhould have eſcaped ſeeing thoſe little drones (they being, according to his account, vaſtly numerous) thruſt their poſterior parts into the cells? Yet none ever ſaw them do it except himſelf; while many have ſeen the queen do it, though but a ſingle bee.

"2. It is well known the queen is very long behind the wings, wiſe nature having made her ſo, in order that ſhe might thruſt her poſterior part into the cells, and yet her wings ſcarcely touch them, nor receive the leaſt injury. If theſe imaginary little drones had to thruſt their poſterior parts into the cells in the ſame manner as the queen, certainly their wings would have been made in the ſame manner ſhort, and their poſterior parts long and taper, which is not the caſe. Whereas were a bee of any kind (the queen excepted) to thruſt its hinder part into a common cell, its wings or coats would come over its head, and be antic like, and injure both them and its body. Beſides, I ſcarcely think they could get into the common cells that way at any rate for want of room.

"3. Mr Debraw grants, that without a queen or eggs bees will not begin to work, as well knowing they cannot propagate their ſpecies without her; and yet he ſays, thoſe bees which wanted little drones began to work, and the queen laid eggs, and all went forward, till they were not impregnated, and then they gave over work, and deſerted the hive. Certainly thoſe ſagacious creatures would have been as ſenſible that they wanted drones at the very firſt, when they were put into the hive, and that they could not do without them, as they are ſenſible when they want a queen, and that it is needleſs to begin work without her; and it might be added, that two different kinds of drones in one hive does not appear to be probable, or ſerve any end.

"But I ſhall narrate ſome of my own experiments on that head, which will put it, I hope, beyond diſpute: On September 1ſt, I had a hive breeding faſt; I took out all her bees (among which were only four large drones, which I killed), and I put them in a hive that had nothing in her but empty combs: I waited ten days, when, by looking between the combs, I ſaw her have new-ſealed up maggots in her cells. I then took all her bees out, and ſhook them into a tub full of water, and recovered them gradually; and when recovering, I preſſed every one of them, in order to ſee if I could find any of thoſe little drones, but could not find one; but all and every one of them had ſtings: they were in number 3000. After which I ſearched the hive I took them out of, and cut out all her combs that had eggs in them, and found they had new laid eggs, four days old eggs, and maggots in them. I then recovered the queen and all the bees, and put in the ſame hive again, which had not an egg in her now, and waited other twenty days, and ſaw her in fine days working very well; a ſure indication ſhe was breeding again. I then turned her up, and cut out one of her brood-combs, and ſaw in it new laid eggs, four days old eggs, and maggots, and ſome young almoſt fit for emerging out of their cells.

"The very ſame day I made a further experiment: I had a hive which I ſaw had ſome brood-combs in her, but ſhe had not had a large drone for four weeks before in her: ſhe had not above 500 bees in her, which favoured me, becauſe few in number. I took the hive into a cloſe place in my houſe, in order that not a ſingle bee ſhould eſcape me: I then took all her bees out of her, and immerſed them in water; and when recovering, I preſſed every one of them, and each bee had a ſting, as in the former experiment.

"I think the above experiments may ſatisfy any judicious perſon, that there is no ſuch thing in being as little drones, unleſs in Mr Debraw's brain. And if Mr Debraw, who can find 57 in a ſmall ſwarm of bees, will ſend me the odd ſeven, I will ſend him one of my beſt hives for them, and he will ſcarcely think he is ill paid. I add, I never ſaw a hive in ſpring, however few bees in her, but ſhe bred ſome if ſhe had a queen, though to be ſure few in proportion to her bees.

"By this time the reader will be very ready, no doubt, to aſk me the uſe of the drones. I beg to be excuſed on that head, as I have not the leaſt idea of their uſe in a hive; they do not fecundate the queen, for ſhe can lay and breed too though ſhe never ſee them. Their heat does not appear to me to be neceſſary for hatching the young, as they are moſtly hatched before any are bred in a hive: and when drones are in the hive, the weather is ſo warm, and ſo many common bees in it, that they appear to have rather too much heat, by their lying out of the hives often.

"I have many times had good hives with few or no drones in them all the year: and Keys is quite wrong when he ſays a top ſwarm will not do without drones in her; for I am poſitive to the contrary, as in the ſummer 1785 I took off four ſwarms of mine own in one day with not a ſingle drone in any of them, and they all throve well, and bred drones in themſelves about four weeks after.

"Although I cannot ſay what uſe the drones are of to a hive (unleſs it be to help away with a great deal of her honey, which they are very good at), yet the beſt hives have them ſooneſt in the year, they generally appearing in ſuch about the latter end of May, and the bees put a period to their lives about Lammas, at which time I give them all the aſſiſtance I can. The way they kill them is thus: They pull and bite them with their teeth, and ſting them alſo. I have ſeen great havoc made of them in one day, as appeared by their lying dead before the door of the hive. But their moſt effectual way of killing them is their baniſhing them from the honey-combs; upon which the drones betake themſelves to the under edges of the hives in great numbers, and to the board the hive ſtands on; and ſometimes, though rare, I have even ſeen them come to the outſide of the hive, and cluſter there about the bulk of a man's hand. When they are baniſhed thus, they are very dull and lifeleſs: and I have lifted up a hive from the board, and there they would have been ſitting cloſe on it, with ſcarcely three or four common bees among them; and I have trod to death 40 or more at a time.

“ We may now take a view of the diſadvantages attending the old, and alſo Mr Debraw's principles on bees, were they true; and next ſee how a hive of bees may be preſerved from coming to ruin, according to my ſentiments on them.

“ 1. The old principles on bees ſay, that without a queen or royal cell be in a hive, it will come to ruin.

“ 2. Mr Debraw's principles ſay, that without little drones be in a hive it will come to ruin.

“ 3. I ſay, if a hive have only new laid eggs in her (which may be eaſily got the greateſt part of the year, in caſe ſhe have none of her own) and common bees, ſhe will find herſelf a queen, and ſo thrive.

“ According to the old principles, it is eaſily ſeen that in caſe a hive loſe her queen when there is no royal cell in her, and no queen can be got to put to her (neither of which can be expected but in June and July), ſhe is entirely ruined.

“ According to the Frenchman's ſcheme, there muſt be drones in a hive at all times of the year to fecundate the eggs, otherwiſe the hive is uſeleſs. Suppoſing his ſentiments to be true (which however can by no means be admitted, ſeeing there is no ſuch thing as little drones), how perplexed would the owner be to know when there were little drones in his hives! When he wanted to make an artificial ſwarm, he might bring off a queen and common bees with her: but how ſhould he come to know whether there were any, or a ſufficient quantity, of little drones among them, as they cannot be diſtinguiſhed from the commons but by immerſion and preſſure, which would be intolerably troubleſome, and next to killing the bees, and not at all practicable? All that could be done would be to hope the beſt, that there were little drones in her at any time of the year.

“ I ſay, if a queen die in a hive, and that hive have ſome new-laid eggs in her, or ſome put to her, in caſe ſhe have none of her own, ſhe will nouriſh up ſome of theſe eggs to be a queen to herſelf: and alſo by taking out a queen and ſome commons out of a hive (without a ſingle drone, large or ſmall), and putting them in an empty hive, will make a ſwarm, and the old hive will breed herſelf a queen again if ſhe have eggs in her.”

Drone-Fly, a two-winged inſect, extremely like the common drone-bee, whence alſo the name.

DROPS, in metereology, ſmall ſpherical bodies which the particles of fluids ſpontaneouſly form themſelves into when let fall from any height. This ſpherical figure, the Newtonian philoſophers demonſtrate to be the effect of corpuſcular attraction; for conſidering that the attractive force of one ſingle particle of a fluid is equally exerted to an equal diſtance, it muſt follow that other fluid particles are on every ſide drawn to it, and will therefore take their places at an equal diſtance from it, and conſequently form a round ſuperficies. See the articles ATTRACTION, FLUID, and RAIN.

DROPS, in medicine, a liquid remedy, the doſe of which is eſtimated by a certain number of drops.

Engliſh DROPS, *Guttæ Anglicanæ*, a name given to a chemical preparation eſteemed of great virtue againſt vapours and lethargic affections, and purchaſed at 5000l. by king Charles II. from the inventor Dr Goddard. The medicine appeared to be only a ſpirit drawn by the retort from raw ſilk, and afterwards rectified with oil of cinnamon, or any other eſſential oil; and was in reality no better than the common ſal volatile oleoſum, or any of the volatile ſpirits impregnated with an eſſential oil, except that it was leſs diſagreeable than any of them to the taſte.

DROPSY, in medicine, an unnatural collection of water in any part of the body. See (the *Index* ſubjoined to) MEDICINE.

DROPWORT, in botany. See FILIPENDULA.

Water DROPWORT, in botany. See OENANTHES.

DROSERA, ROS SOLIS, or *Sun-Dew*, in botany: A genus of the pentagynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is quinquefid, the petals five; the capſule unilocular, and quinquevalved at top; the ſeeds very numerous. There are three ſpecies, which grow naturally in boggy places in many parts of the kingdom. They ſeem to receive the name of *ſun-dew* from a very ſtriking circumſtance in their appearance. The leaves, which are circular, are fringed with hairs ſupporting ſmall drops or globules of a pellucid liquor like dew, which continue even in the hotteſt part of the day and in the fulleſt expoſure to the ſun. The whole plant is acrid, and ſufficiently cauſtic to erode the ſkin: but ſome ladies know how to mix the juice with milk, ſo as to make it an innocent and ſafe application to remove freckles and ſun-burn. The juice that exſudes from it unmixed, will deſtroy warts and corns. The plant hath the ſame effect upon milk that the common butterwort hath; and like that too is ſuppoſed to occaſion the rot in ſheep.

DROWNING, ſignifies the extinction of life by a total immerſion in water.

In ſome reſpects, there ſeems to be a great ſimilarity between the death occaſioned by immerſion in water, and that by ſtrangulation, ſuffocation by fixed air, apoplexies, epilepſies, ſudden faintings, violent ſhocks of electricity, or even violent falls and bruiſes. Phyſicians, however, are not agreed with regard to the nature of the injury done to the animal ſyſtem in any or all of theſe accidents. It is indeed certain, that in all the caſes above mentioned, particularly in drowning, there is very often ſuch a ſuſpenſion of the vital powers as to us hath the appearance of a total extinction of them; while yet they may be again ſet in motion, and the perſon reſtored to life, after a much longer ſubmerſion than hath been generally thought capable of producing abſolute death. It were to be wiſhed, however, that as it is now univerſally allowed that drowning is only a ſuſpenſion of the action of the vital powers, phyſicians could as unanimouſly determine the means by which theſe powers are ſuſpended; becauſe on a knowledge of theſe means, the methods to be uſed for recovering drowned perſons muſt certainly depend.

Dr de Haen, who hath written a treatiſe on this ſubject, aſcribes this diverſity of opinion among the phyſicians to their being ſo ready to draw general concluſions from a few experiments. Some, having never found water in the lungs, have thought that it never was there; and others, from its preſence, have drawn a contrary concluſion. Some have aſcribed the death which happens in caſes of drowning, to that ſpecies of apoplexy which ariſes from a great fulneſs of the ſtomach. But this opinion our author rejects, becauſe in 13 dogs which he had drowned and afterwards diſſected, no ſigns of ſuch a fulneſs appeared. Another reaſon is drawn from the want of the common marks of apoplexy on the diſſection of the brain, and from the actual preſence of water in the lungs. He is of opinion, that the death of drowned perſons happens in conſequence of water getting into the lungs, and ſtopping the blood in the arteries. He then diſcuſſes the queſtion how far the blowing of air into the lungs is uſeful in recovering drowned people. If their death is to be aſcribed to the water entering the lungs, this practice, he obſerves, muſt be hurtful, as it will increaſe the preſſure on the blood-veſſels, or may even force the water into them; which, on the authority of Lewis's experiments, he alleges is poſſible. But, in ſpite of this reaſoning, he aſſerts, that from experience it has been found uſeful. He allows, that the practice of ſuſpending drowned people by the feet muſt be hurtful, by determining the blood too much to the head; but he obſerves, that remedies in ſome reſpects hurtful may be uſed when the advantages derived from them preponderate; and is of opinion, that the practice above mentioned may be uſeful by agitating the viſcera againſt each other, and thus renewing their motions. Cutting the larynx in order to admit air more freely to the lungs, he reckons to be of little or no uſe; but acknowledges, however, that it may ſometimes prove beneficial on account of the irritation occaſioned by the operation.

Dr Cullen, in his Letter to Lord Cathcart concerning the recovery of perſons drowned and ſeemingly dead, tells us, that "From the diſſection of drowned men, and other animals, it is known, that very often the water does not enter into the cavity of the lungs, nor even into the ſtomach, in any quantity to do hurt to the ſyſtem; and, in general, it is known, that, in moſt caſes, no hurt is done to the organization of the vital parts. It is therefore probable, that the death which enſues, or ſeems to enſue, in drowned perſons, is owing to the ſtoppage of reſpiration, and to the ceaſing, in conſequence, of the circulation of the blood, whereby the body loſes its heat, and, with that, the activity of the vital principle."

In the Phil. Tranſ. Vol. LXVI. Mr Hunter gives the following theory. The loſs of motion in drowning, ſeems to ariſe from the loſs of reſpiration; and the immediate effect this has upon the other vital motions of the animal, at leaſt this privation of breathing, appears to be the firſt cauſe of the heart's motion ceaſing. It is moſt probable, therefore, Mr Hunter obſerves, that the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion; for if a ſufficiency of life ſtill remains to produce that effect, we may ſuppoſe every part equally ready to move the very inſtant in which the action of the heart takes place, their actions depending ſo much upon it. What makes it very probable, that the principal effect depends upon throwing air into the lungs, is, that children in the birth, when too much time has been ſpent after the loſs of that life which is peculiar to the fetus, loſe altogether the diſpoſition for the new life. In ſuch caſes there is a total ſuſpenſion of the actions of life; the child remains to all appearance dead; and would die, if air was not thrown into its lungs, and the firſt principle of action by that means reſtored. To put this in a clearer light, Mr Hunter gives the reſult of ſome experiments made on a dog in 1755.—A pair of double bellows were provided, which were ſo conſtructed, that by one action air was thrown into the lungs, and by the other the air was ſucked out which had been thrown in by the former, without mixing them together. The muzzle of theſe bellows was fixed into the trachea of a dog, and by working them he was kept perfectly alive. While this artificial breathing was going on, the ſternum was taken off, ſo that the heart and lungs were expoſed to view. The heart then continued to act as before, only the frequency of its action was greatly increaſed. Mr Hunter then ſtopped the motion of the bellows; and obſerved that the contraction of the heart became gradually weaker and leſs frequent, till it left off moving altogether; but by renewing the operation, the motion of the heart alſo revived, and ſoon became as ſtrong and frequent as before. This proceſs was repeated upon the ſame dog ten times; ſometimes ſtopping for five, eight, or ten minutes. Mr Hunter obſerved, that every time he left off working the bellows, the heart became extremely turgid with blood, and the blood in the left ſide became as dark as that in the right, which was not the caſe when the bellows were working. Theſe ſituations of the animal, he obſerves, ſeem to be exactly ſimilar to drowning.

Dr Edmund Goodwyn, in a treatiſe lately publiſhed on this ſubject, has endeavoured to aſcertain the effects of ſubmerſion upon living animals in a more accurate manner than had hitherto been done. His firſt care was to determine the ſymptoms which took place before death; and to obſerve theſe, he procured a large glaſs bell in which the animals were to be immerſed. Having inverted, and filled this with water, he put into it ſeveral cats, dogs, rabbits, and ſmaller animals, confining them among the water till they were apparently dead. In theſe experiments he obſerved, that immediately after ſubmerſion the pulſe became weak and frequent; there was an apparent anxiety about the breaſt, and ſtruggling to relieve it. In theſe ſtruggles the animal roſe to the top of the water, throwing out a quantity of air from the lungs. After this the anxiety increaſes, the pulſe becomes weaker, and the ſtruggles more violent; he riſes again to the ſurface, throws out more air from the lungs, and in his efforts to inſpire, a quantity of water commonly paſſes into the mouth. The ſkin about the face and lips then becomes blue, the pulſe ceaſes, the ſphincters are relaxed, and the animal falls down without ſenſe or motion. On diſſecting the bodies of drowned animals, our author met with the following appearances: 1. The external ſurface of the brain was darker, but the veſſels of it were not more turgid than uſual, nor was there any appearance of extravaſation. 2. The pulmonary arteries and veins were filled with black blood, and the lungs themſelves contained ſome frothy liquid. 3. Notwithſtanding theſe ſymptoms, the right auricle and ventricle were ſtill contracting and dilating; the left ſinus venoſus and auricle moving feebly, but the left ventricle at reſt. 4. The right and left auricles of the heart, the right ventricle, and the left ſinus venoſus, were filled with black blood; but the laſt ventricle only half filled with the ſame, and a quantity of the ſame black blood was alſo contained in the ſmaller branches of the arteries proceeding from the left ventricle.

This inveſtigation was followed by a moſt careful and ingenious inquiry concerning the cauſes of the ſymptoms already related. To find out whether or not the entrance of water into the lungs was the cauſe, or whether water really entered the lungs in theſe caſes or not, he drowned ſeveral animals among ink; and by inſpecting their bodies, found, that though water really did enter, it was in ſuch ſmall quantity that it could not be ſuppoſed capable of producing ſuch violent effects. To aſcertain this, however, more exactly than could be done by the ink, he drowned other animals in quickſilver; which, by reaſon of its not being miſcible with the animal fluids, could be more accurately collected. By theſe it appeared that no more than five drachms of the fluid in which a cat was immerſed entered her lungs in the time of drowning; and to determine whether or not this could be the occaſion of the animal's death, he made the following experiment: Having confined a cat in an erect poſture, he made a ſmall opening in the trachea, by cutting one of the cartilaginous rings; and through this opening he introduced two ounces of water into the lungs. The only conſequences were a difficulty of breathing and weak pulſe; but theſe ſoon abated, and it lived ſeveral hours afterwards without any apparent inconvenience. On ſtrangling it he found two ounces and a half of water in the lungs. On repeating the experiment with other fluids, he found the difficulty of breathing and alteration in the pulſe ſomewhat greater: but in theſe inſtances alſo they abated in a few hours; and when the animals were ſtrangled, the lungs were found to contain four ounces of fluid.

From all theſe experiments Dr Goodwyn draws the following concluſions: 1. "A ſmall quantity of fluid uſually paſſes into the lungs in drowning. 2. This water enters the lungs during the efforts to inſpire; and mixing with the pulmonary mucus, occaſions the frothy appearance mentioned by authors. 3. The whole of this fluid in the lungs is not ſufficient to produce the changes that take place in drowning. And hence it follows, that the water produces all the changes that take place in drowning *indirectly*, by excluding the atmoſpheric air from the lungs." This naturally leads to an inveſtigation of the uſes of reſpiration, and the effects of the air upon the blood and lungs in that action, which our author traces with great accuracy and very convincing experiments. He begins with attempting to determine the quantity of air drawn in at each inſpiration, with the proportional quantity left after expiration. The experiments by which he endeavoured to aſcertain theſe quantities ſeem to be more uncertain than the others, as indeed there are not data ſufficient for them. From ſuch as he had an opportunity of making, however, the following concluſions were deduced: 1. "The lungs contain 109 cubic inches of air after a complete expiration; and this quantity receives an additional quantity of 14 cubic inches during each inſpiration. 2. The dilatation of the lungs after expiration is to their dilatation after inſpiration as 109 to 123. 3. The blood circulates through the pulmonary veſſels in all the degrees of natural reſpiration. 4. The circulation through them, after expiration, is ſufficiently free to keep up the health of the ſyſtem."

The laſt part of our author's inquiry, *viz.* concerning the chemical changes produced in the air by reſpiration, and the effects of the air upon the blood itſelf, falls naturally to be conſidered under the article RESPIRATION: ſo that here we ſhall only obſerve in general, that his experiments evidently ſhow that the diſeaſe produced by drowning ariſes entirely from the excluſion of the atmoſpheric air or its dephlogiſticated part; for which reaſon he recommends inflating the lungs with that kind of air in preference to any other.

From theſe different views of this matter, phyſicians have differed conſiderably in their account of the methods to be followed in attempting the recovery of drowned perſons. De Haen recommends agitation of all kinds; every kind of ſtimulus applied to the mouth, noſe, and rectum; bleeding; heat, both by warm cloths and warm water; blowing air into the trachea; ſtimulants, ſuch as bliſters, warm aſhes, &c. applied to the head, ankles, thighs, pit of the ſtomach, and other parts.

Doctor Cullen's obſervations on this ſubject are as follow.—"With reſpect to the particular means to be employed for the recovery of drowned perſons, it is to be obſerved, in the firſt place, That ſuch as were recommended and practiſed, upon a ſuppoſition that the ſuffocation was occaſioned by the quantity of water taken into the body, and therefore to be evacuated again, were very unhappily adviſed. The hanging up of perſons by the heels, or ſetting them upon the crown of the head, or rolling the body upon a caſk, were generally practiſed, upon a ſuppoſition altogether falſe; or upon the ſuppoſition of a caſe which, if real, is apprehended to be irrecoverable. At the ſame time, theſe practices were always attended with the danger of burſting ſome veſſels in the brain or lungs, and of rendering thereby ſome caſes incurable that were not ſo from the drowning alone. All ſuch practices, therefore, are now very properly diſapproved of and forbid.

"In thoſe caſes in which the body has not been long in the water, and in which therefore the natural heat is not entirely extinguiſhed, nor the irritability of the moving fibres very greatly impaired, it is poſſible that a good deal of agitation of the body may be the only means neceſſary to reſtore the action of the vital organs;

gans; but in other caſes, where the heat and irritability have ceaſed to a greater degree, it is to me very doubtful, if much agitation can be ſafe, and if any degree of it can be uſeful, till the heat and irritability are in ſome meaſure reſtored. In all caſes, any violent concuſſion cannot be ſafe, and, I believe, is never neceſſary. It may be proper here to obſerve alſo, that in tranſporting the body from the place where it is taken out of the water, to the place where it may be neceſſary for applying the proper means of its recovery, all poſtures expoſing to any improper compreſſion, as that of the body's being carried over a man's ſhoulder, are to be avoided. The body is to be kept ſtretched out, with the head and upper parts a little raiſed; and care is to be taken to avoid the neck's being bent much forward. In this manner, laid upon one ſide, and upon ſome ſtraw in a cart, it may be moſt properly conveyed; and the agitation which a pretty briſk motion of the cart may occaſion, will, in moſt caſes, do no harm.

“ From the account I have given above of the cauſes, or of the appearances, of death, in drowned perſons, it is evident, that the firſt ſtep to be taken for their recovery is to reſtore the heat of the body, which is abſolutely neceſſary to the activity of the moving fibres. For this purpoſe, the body, as ſoon as poſſible, is to be ſtripped of its wet clothes, to be well dried, and to be wrapped up in dry, and (if poſſible) warm, coverings: and it is to be wiſhed, in all caſes, as ſoon as the report of a perſon's being drowned is heard, that blankets ſhould be immediately carried to the water-ſide; ſo that, as ſoon as the body is got out of the water, the change of covering juſt now mentioned may be inſtantly made; or, if the body has been naked when drowned, that it may be immediately dried, and defended againſt the cold of the air. Beſides covering the body with blankets, it will be further of advantage, if it can be done without loſe of time, to cover the drowned body with a warm ſhirt or waiſtcoat immediately taken from a living perſon.

“ When, at the time of a perſon's being drowned, it happens that the ſun ſhines out very hot, I think there can be no better means of recovering the heat, than by expoſing the naked body, in every part, to the heat of the ſun; while, at the ſame time, all other means neceſſary or uſeful for the recovery of life are alſo employed.

“ When the heat of the ſun cannot be employed, the body ſhould be immediately tranſported to the neareſt houſe that can be got convenient for the purpoſe: the fitteſt will be one that has a tolerably large chamber, in which a fire is ready, or can be made; and if poſſible, the houſe ſhould afford another chamber, in which alſo a fire can be provided.

“ When the drowned body is brought into ſuch houſe, and care is at the ſame time taken that no more people are admitted than are abſolutely neceſſary to the ſervice of the drowned perſon, every endeavour muſt be immediately employed for recovering the heat of the body, and that by different meaſures, as circumſtances ſhall direct.

“ If, in the neighbourhood of the place, there be any brewery, diſtillery, dyery, or fabric which gives an opportunity of immediately obtaining a quantity of warm water and a convenient veſſel, there is nothing more proper than immerſing the body in a warm bath. Even where a ſufficient quantity of warm water cannot be had at once, the bath may be ſtill practiſed, if the accident has happened in or very near a town or village, when a great many fires may be at once employed in heating ſmall quantities of water; for in this way the neceſſary quantity may be ſoon obtained. To encourage this practice, it is to be obſerved, that one part of boiling water is more than ſufficient to give the neceſſary heat to two parts of ſpring or ſea water, as it is not proper to apply the bath at firſt very warm, nor even of the ordinary heat of the human body, but ſomewhat under it; and, by the addition of warm water, to bring it gradually to a heat very little above it.

“ If the drowned body be of no great bulk, it may be conveniently warmed by a perſon's lying down in bed with it, and taking it near to their naked body, changing the poſition of it frequently, and at the ſame time chaffing and rubbing with warm cloths the parts which are not immediately applied to their warm body.

“ If none of theſe meaſures can be conveniently practiſed, the body is to be laid upon a bed before a moderate fire, and frequently turned, to expoſe the different parts of it; and thus, by the heat of the fire gradually applied, and by rubbing the body well with coarſe towels, or other cloths well warmed, pains are to be taken for reſtoring its heat. This will be promoted by warm cloths applied and frequently renewed under the hams and arm-pits; and by hot bricks, or bottles of warm water, laid to the feet.

“ In the practice of rubbing, it has been propoſed to moiſten the cloths applied with camphorated ſpirits, or other ſuch ſtimulating ſubſtances: but I think this muſt prove an impediment to the rubbing; and I would not recommend any practice of this kind, except, perhaps, the application of the vinous ſpirit of ſal ammoniac to the wriſts and ankles only.

“ For recovering the heat of the body, it has been propoſed to cover it all over with warm grains, aſhes, ſand, or ſalt; and where theſe, ſufficiently warm, are ready at hand, they may be employed; but it is very ſeldom they can be obtained, and the application might often interfere with other meaſures that may be neceſſary. All therefore that I can propoſe, with reſpect to the uſe of theſe, is to obſerve, that bags of warm and dry ſalt may be amongſt the moſt convenient applications to the feet and hands of drowned perſons; and the quantity neceſſary for this purpoſe may be got pretty quickly by heating the ſalt in a frying-pan over a common fire.

“ While theſe meaſures are taking for recovering the heat, means are at the ſame time to be employed for reſtoring the action of the moving fibres. It is well known, that the inteſtines are the parts of the body which, both from their internal ſituation and peculiar conſtitution, retain the longeſt their irritability; and therefore, that, in drowned perſons, ſtimulants applied may have more effect upon the inteſtines than upon other parts. The action, therefore, of the inteſtines is to be ſupported or renewed as ſoon as poſſible; as the reſtoring and ſupporting the action of ſuch a conſiderable portion of moving fibres as thoſe of the inteſtines, muſt contribute greatly to reſtore the activity of the whole ſyſtem.

“ For exciting the action of the inteſtines, the moſt proper mean is, the application of their ordinary ſtimulus of dilatation; and this is moſt effectually applied, by forcing a quantity of the air into them by the fundament. Even the throwing in cold air has been found uſeful: but it will certainly be better if heated air can be employed; and further, if that air can be impregnated with ſomething which, by its acrimony alſo, may be powerful in ſtimulating the inteſtines.

“ From all theſe conſiderations, the ſmoke of burning tobacco has been moſt commonly applied, and has upon many occaſions proved very effectual. This will be moſt properly thrown in by a particular apparatus, which, for other purpoſes as well as this, ſhould be in the hands of every ſurgeon; or at leaſt ſhould, at the public expence, be at hand in every part of the country where drownings are likely to happen. With regard to the uſe of it, I have to obſerve, that till the tobacco is kindled in a conſiderable quantity, a great deal of cold air is blown through the box and tube; and as that, as hinted above, is not ſo proper, care ſhould be taken to have the tobacco very well kindled, and to blow through it very gently, till the heated ſmoke only paſſes through. If, upon certain occaſions, the apparatus referred to ſhould not be at hand, the meaſure however may be executed by a common tobacco pipe, in the following manner: A common glyſter-pipe that has a bag mounted upon it, is to be introduced into the fundament, and the mouth of the bag is to be applied round the ſmall end of a tobacco-pipe. In the bowl of this, tobacco is to be kindled; and, either by a playing card made into a tube and applied round the mouth of the bowl, or by applying upon this the bowl of another pipe that is empty, and blowing through it, the ſmoke may be thus forced into the inteſtines, and, in a little time, in a conſiderable quantity.

“ If none of theſe means for throwing in the ſmoke can be employed, it may be uſeful to inject warm water to the quantity of three or four Engliſh pints. This may be done by a common glyſter-bag and pipe, but better by a large ſyringe; and it may be uſeful to diſſolve in the water ſome common ſalt, in the proportion of half an ounce to an Engliſh pint; and alſo, to add to it ſome wine or brandy.

“ While theſe meaſures for recovering the heat of the body and the activity of the moving fibres are employed, and eſpecially after they have been employed for ſome time, pains are to be taken to complete and finiſh the buſineſs, by reſtoring the action of the lungs and heart.

“ On this ſubject, I am obliged to my learned and ingenious colleague Dr Monro, who has made ſome experiments for aſcertaining the beſt manner of inflating the lungs of drowned perſons. By theſe experiments he finds it may be more conveniently done by blowing into one of the noſtrils, than by blowing into the mouth. For blowing into the noſtril, it is neceſſary to be provided with a wooden pipe, fitted at one extremity for filling the noſtril, and at the other for being blown into by a perſon's mouth, or for receiving the pipe of a pair of bellows, to be employed for the ſame purpoſe. Doctor Monro finds, that a perſon of ordinary ſtrength can blow into ſuch a pipe, with a ſufficient force to inflate the lungs to a conſiderable degree; and thinks the warm air from the lungs of a living perſon will be moſt conveniently employed at firſt; but when it is not ſoon effectual in reſtoring the reſpiration of the drowned perſon, and that a longer continuance of the inflation is neceſſary, it may be proper to employ a pair of bellows, large enough at once to contain the quantity of air neceſſary to inflate the lungs to a due degree.

“ Whether the blowing-in is done by a perſon's mouth, or by bellows, Dr Monro obſerves, that the air is ready to paſs by the gullet into the ſtomach; but that this may be prevented, by preſſing the lower part of the larynx backwards upon the gullet. To perſons of a little knowledge in anatomy, it is to be obſerved, that the preſſure ſhould be only upon the cricoid cartilage, by which the gullet may be ſtraitened, while the paſſage through the larynx is not interrupted.

“ When, by blowing thus into the noſtril, it can be perceived, by the raiſing of the cheſt or belly, that the lungs are filled with air, the blowing in ſhould ceaſe; and by preſſing the breaſt and belly, the air received into the lungs ſhould be again expelled; then the blowing and expulſion ſhould be again repeated; and thus the practice is to be continued, ſo as to imitate, as exactly as poſſible, the alternate motions of natural reſpiration.

“ It is hardly neceſſary to obſerve, that when the blowing into the noſtril is practiſed, the other noſtril and the mouth ſhould be accurately cloſed.

“ If it ſhould happen that in this practice the air does not ſeem to paſs readily into the lungs, Doctor Monro informs me it is very practicable to introduce directly into the glottis and trachea a crooked tube, ſuch as the catheter uſed for a male adult. For this he offers the following directions: The ſurgeon ſhould place himſelf on the right ſide of the patient; and, introducing the forefinger of his left hand at the right corner of the patient's mouth, he ſhould puſh the point of it behind the epiglottis; and uſing this as a directory, he may enter the catheter, which he holds in his right hand, at the left corner of the patient's mouth, till the end of it is paſſed beyond the point of his forefinger; and it is then to be let fall, rather than puſhed into the glottis; and through this tube, by a proper ſyringe applied to it, air may be with certainty blown into the lungs. I obſerve, that ſome ſuch meaſure had been propoſed by Monſ. le Cat in France; but I have not learned that it has ever been put in practice, and I am afraid it may be attended with ſeveral difficulties, and muſt be left to the diſcretion of ſurgeons, who may be properly provided and inſtructed for this purpoſe.

“ For throwing air with more certainty into the lungs, it has been propoſed to open the windpipe in the ſame manner as is done in the operation which the ſurgeons call *bronchotomy*, and by this opening to blow into the lungs; and when the blowing into the noſtril does not ſeem to ſucceed, and a ſkilful operator is at hand, I allow that the meaſure may be tried; but I can hardly ſuppoſe, that it will be of any advantage when the blowing in by the noſtril has entirely failed.

“ It is to be hoped, that by blowing into the lungs one way or other, even a quantity of water which had been taken into the lungs may be again waſhed out; and the ſame ſeems to be the only effectual means of waſhing out that frothy matter which is found to fill the lungs of drowned perſons, and which proves, if I miſtake not, the moſt common cauſe of their mortal ſuffocation. This practice, therefore, is to be immediately entered upon, and very aſſiduouſly continued for an hour or two together.

“ I have now mentioned the meaſures chiefly to be purſued and depended upon for the recovery of drowned perſons; but muſt ſtill mention ſome others that may prove conſiderable helps to it.

“ One of theſe is, the opening the jugular veins to relieve the congeſtion, which almoſt conſtantly occurs in the veins of the head, and is probably a frequent cauſe of the death of drowned perſons. For relieving this congeſtion, the drawing ſome blood from the jugulars, very early, may certainly be of ſervice; and it will be particularly indicated by the livid and purple colour of the face. It may even be repeated, according to the effect it ſeems to have in taking off that ſuffuſion; but when the drowned perſon is in ſome meaſure recovered, and ſome motion of the blood is reſtored, it will be proper to be very cautious in making this evacuation, and at leaſt to take care not to puſh it ſo far as to weaken too much the recovering, but ſtill weak, powers of life.

“ Another meaſure for recovering the activity of the vital principle, is the application of certain ſtimulants to the more ſenſible parts of the body, ſuch as holding the quick-lime ſpirit of ſal ammoniac to the noſe, or putting a little of it upon a rag into the noſtrils. It has been uſual to pour ſome liquids into the mouth; but it is dangerous to pour in any quantity of liquid, till it appear that the power of ſwallowing is in ſome meaſure reſtored.

“ When a ſurgeon is at hand, and is provided with proper apparatus, a crooked pipe may be introduced into the gullet; and by this a gill or two of warm wine may be poured down into the ſtomach, and probably with advantage. But when no ſuch apparatus is at hand, or ſurgeon to employ it, and the power of ſwallowing is ſtill doubtful, the trial of pouring liquids into the mouth ſhould be made by a ſmall quantity of warm water alone; and when, from ſuch trial, the power of ſwallowing ſhall appear to be recovered, it may then be allowable to favour the further recovery of the perſon, by pouring in ſome wine or brandy.— In ſhort, till ſome marks of the recovery of ſwallowing and reſpiration appear, it will not be ſafe to apply any ſtimulants to the mouth; excepting that of a few drops of ſome acrid ſubſtance to the tongue, and which are not of bulk enough to ſlide back upon the glottis: I can think of no ſtimulant more conveniently and ſafely to be applied to the mouth and noſtrils, than a moderate quantity of tobacco-ſmoke blown into them.

“ Though I do not imagine that drowned perſons are ever hurt by the quantity of water taken into their ſtomach, yet, as a ſtimulus applied to the ſtomach, and particularly as the action of vomiting proves a ſtimulus to the whole ſyſtem, I can have no objection to the French practice of throwing in an emetic as ſoon as any ſwallowing is reſtored. For this purpoſe, I would ſucceſſively throw in ſome tea-ſpoonfuls of the ipecacuanha wine; and when it does not interfere with other neceſſary meaſures, the fauces may be gently irritated by an oiled feather thruſt into them.

“ With regard to the ſtimulants, I muſt conclude with obſerving, That when a body has lain but for a ſhort time in the water, and that therefore its heat and irritability are but little impaired, the application of ſtimulants alone has been often found effectual for the recovery: but, on the contrary, when the body has lain long in the water, and the heat of it is very much extinguiſhed, the application of any other ſtimulants than that of tobacco-ſmoke to the inteſtines can be of very little ſervice; and the application of others ought never to interfere with the meaſures for recovering heat and the motion of reſpiration.

“ With reſpect to the whole of theſe practices, I expect, from the principles upon which they are in general recommended, it will be underſtood, that they are not to be ſoon diſcontinued, though their effects do not immediately appear. It is obvious, that, in many caſes, it may be long before the heat of the body, and the activity of the vital principle, can be reſtored, although, in a longer time, it may very poſſibly be accompliſhed. In fact, it has often happened, that tho' means employed for one hour have not ſucceeded, the ſame continued for two or more hours, have at length had the wiſhed for effects. It ſhould therefore be a conſtant rule, in this buſineſs, that the proper means ſhould be employed for ſeveral hours together; unleſs it happen, that, while no ſymptoms of returning life appear, the ſymptoms of death ſhall, at the ſame time, go on conſtantly increaſing.

“ In the whole of the above I have kept in view chiefly the caſe of drowned perſons: but it will be obvious, that many of the meaſures propoſed will be equally proper and applicable in other caſes of ſuffocation; as thoſe from ſtrangling, the damps of mines, the fumes of charcoal, &c.; and a little attention to the difference of circumſtances will lead to the meaſures moſt proper to be employed.”

Mr Hunter, in the before-mentioned paper, differs pretty conſiderably from De Haen and Dr Cullen. He obſerves, that when aſſiſtance is ſoon called in after immerſion, blowing air into the lungs will in ſome caſes effect a recovery; but when any conſiderable time has been loſt, he adviſes ſtimulant medicines, ſuch as the vapour of volatile alkali, to be mixed with the air; which may eaſily be done, by holding ſpirits of hartſhorn in a cup under the receiver of the bellows. And, as applications of this kind to the olfactory nerves tend greatly to rouſe the living principle, and put the muſcles of reſpiration into action, it may probably, therefore, be moſt proper to have air impregnated in that manner thrown in by the noſe. To prevent the ſtomach and inteſtines from being too much diſtended by the air ſo injected, the larynx is directed to be gently preſſed againſt the œſophagus and ſpine.

While this buſineſs is going on, an aſſiſtant ſhould prepare bed-cloaths, carefully brought to a proper degree of heat. Heat our author conſiders as congenial with the living principle; increaſing the neceſſity of action, it increaſes action; cold, on the other hand, leſſens the neceſſity, and of courſe the action is diminiſhed: to a due degree of heat, therefore, the living principle, he thinks, owes its vigour. From experiments, he ſays, it appears to be a law in animal bodies, that the degree of heat ſhould bear a proportion to the quantity of life; as life is weakened, this proportion requires great accuracy, while greater powers of life allow it greater latitudes.

After theſe and ſeveral other obſervations on the ſame ſubject, our author proceeds to more particular directions for the management of drowned people.

If bed-cloaths are put over the perſon, ſo as ſcarce to touch him, ſteams of volatile alkali, or of warm balſams, may be thrown in, ſo as to come in contact with many parts of the body. And it might probably be advantageous, Mr Hunter obſerves, to have ſteams of the ſame kind conveyed into the ſtomach. This, we are told, may be done by a hollow bougie and a ſyringe; but the operation ſhould be very ſpeedily performed, as the inſtrument, by continuing long in the mouth, might produce ſickneſs, which our author ſays he would always wiſh to avoid.

Some of the warm ſtimulating ſubſtances, ſuch as juice of horſe-radiſh, peppermint water, and ſpirits of hartſhorn, are directed to be thrown into the ſtomach in a fluid ſtate, as alſo to be injected by the anus. Motion poſſibly may be of ſervice; it may at leaſt be tried: but as it hath leſs effect than any other of the uſually preſcribed ſtimuli, it is directed to be the laſt part of the proceſs.

The ſame care in the operator, in regulating the proportion of every one of theſe means, is here directed, as was formerly given for the application of heat. For every one of them, our author obſerves, may poſſibly have the ſame property of deſtroying entirely the feeble action which they have excited, if adminiſtered in too great a quantity: inſtead, therefore, of increaſing and haſtening the operations on the firſt ſigns of returning life being obſerved, as is uſually done, he deſires they may be leſſened; and adviſes their increaſe to be afterwards proportioned, as nearly as poſſible, to the quantity of powers as they ariſe.

When the heart begins to move, the application of air to the lungs ſhould be leſſened, that, when the muſcles of reſpiration begin to act, a good deal may be left for them to do.

Mr Hunter abſolutely forbids blood-letting in all ſuch caſes; for, as it not only weakens the animal principle, but leſſens life itſelf, it muſt conſequently, he obſerves, leſſen both the powers and diſpoſitions to action. For the ſame reaſon, he is againſt introducing any thing into the ſtomach that might produce ſickneſs or vomiting; and, on the ſame principle, he ſays, we ſhould avoid throwing tobacco fumes, or any other ſuch articles, up by the anus, as might tend to an evacuation that way.

The following is a deſcription of inſtruments recommended for ſuch operations by our author.

Firſt, A pair of bellows, ſo contrived, with two ſeparate cavities, that, by opening them when applied to the noſtrils or mouth of a patient, one cavity will be filled with common air, and the other with air ſucked out from the lungs, and by ſhutting them again, the common air will be thrown into the lungs, and that ſucked out of the lungs diſcharged into the room. The pipe of theſe ſhould be flexible; in length a foot, or a foot and an half; and, at leaſt, three eighths of an inch in width. By this the artificial breathing may be continued, while the other operations, the application of the ſtimuli to the ſtomach excepted, are going on, which could not be conveniently done if the muzzle of the bellows were introduced into the noſe. The end next the noſe ſhould be double, and applied to both noſtrils. *Secondly*, A ſyringe, with a hollow bougie, or flexible catheter, of ſufficient length to go into the ſtomach, and convey any ſtimulating matter into it, without affecting the lungs. *Thirdly*, A pair of ſmall bellows, ſuch as are commonly uſed in throwing fumes of tobacco up by the anus.

Notwithſtanding the differences in theory, however, between the phyſicians above mentioned, it is certain, that within theſe few years great numbers of drowned people have been reſtored to life by a proper uſe of the remedies we have enumerated, and ſocieties for the recovery of drowned perſons have been inſtituted in different places. The firſt ſociety of this kind was inſtituted in Holland, where, from the great abundance of canals and inland ſeas, the inhabitants are particularly expoſed to accidents by water. In a very few years 150 perſons were ſaved from death by this ſociety; and many of theſe had continued upwards of an hour without any ſigns of life, after they had been taken out of the water. The ſociety was inſtituted at Amſterdam in 1767: and, by an advertiſement, informed the inhabitants of the United Provinces of the methods proper to be uſed on ſuch occaſions; offering rewards at the ſame time to thoſe who ſhould, with or without ſucceſs, uſe thoſe methods for recovering perſons drowned and ſeemingly dead. The laudable and humane example of the Dutch was followed in the year 1768 by the magiſtrates of health in Milan and Venice; afterwards by the magiſtrates of Hamburg in the year 1771, by thoſe of Paris in the year 1772, and by the magiſtrates of London in 1774.

The following directions are given for the recovery of drowned perſons by the ſociety at London.

I. As ſoon as the patient is taken out of the water, the wet cloaths, if the perſon is not naked at the time of the accident, ſhould be taken off with all poſſible expedition on the ſpot (unleſs ſome convenient houſe be very near), and a great-coat or two, or ſome blankets if convenient, ſhould be wrapped round the body.

II. The patient is to be thus carefully conveyed in the arms of three or four men, or on a bier, to the neareſt public or other houſe, where a good fire, if in the winter ſeaſon, and a warm bed, can be made ready for its reception. As the body is conveying to this place, great attention is to be paid to the poſition of the head; it muſt be kept ſupported in a natural and eaſy poſture, and not ſuffered to hang down.

III. In cold or moiſt weather, the patient is to be laid on a matraſs or bed before the fire, but not too near, or in a moderately heated room: in warm and ſultry weather, on a bed only. The body is then to be wrapped as expeditiouſly as poſſible with a blanket, and thoroughly dried with warm coarſe cloths or flannels.

IV. In ſummer or ſultry weather too much air cannot be admitted. For this reaſon it will be neceſſary to ſet open the windows and doors, as cool refreſhing air is of the greateſt importance in the proceſs of reſuſcitation.

V. Not more than ſix perſons are to be preſent to apply the proper means; a greater number will be uſeleſs, and may retard, or totally prevent, the reſtoration of life, by rendering the air of the apartment unwholeſome. It will be neceſſary, therefore, to requeſt the abſence of thoſe who attend merely from motives of curioſity.

VI. It will be proper for one of the aſſiſtants, with a pair of bellows of the common ſize, applying the pipe a little way up one noſtril, to blow with ſome force, in order to introduce air into the lungs; at the ſame time the other noſtril and the mouth are to be cloſed by another aſſiſtant, whilſt a third perſon gently preſſes the cheſt with his hands, after the lungs are obſerved to be inflated. By purſuing this proceſs, the noxious and ſtagnant vapours will be expelled, and natural breathing imitated. If the pipe of the bellows be too large, the air may be blown in at the mouth, the noſtrils at the ſame time being cloſed, ſo that it may not eſcape that way: but the lungs are more eaſily filled, and natural breathing better imitated, by blowing up the noſtril.

VII. Let the body be gently rubbed with common ſalt, or with flannels, ſprinkled with ſpirits, as rum or geneva (A). A warming-pan heated (the body being ſurrounded with flannel) may be lightly moved up and down the back. Fomentations of hot brandy are to be applied to the pit of the ſtomach, loins, &c. and often renewed. Bottles filled with hot water, heated tiles covered with flannel, or hot bricks, may be efficaciouſly applied to the ſoles of the feet, palms of the hands, and other parts of the body. The temples may be rubbed with ſpirits of hartſhorn, and the noſtrils now and then tickled with a feather; and ſnuff, or *eau de luce*, ſhould be occaſionally applied.

VIII. Tobacco fumes ſhould be thrown up the fundament; if a fumigator be not at hand, the common pipe may anſwer the purpoſe. The operation ſhould be frequently performed, as it is of importance; for the good effects of this proceſs have been experienced in a variety of inſtances of ſuſpended animation. But ſhould the application of tobacco-ſmoke in this way not be immediately convenient, or other impediments ariſe, clyſters of this herb, or other acrid infuſions with ſalt, &c. may be thrown up with advantage.

IX. When theſe means have been employed a conſiderable time without ſucceſs, and any brewhouſe or warm bath can be readily obtained, the body ſhould be carefully conveyed to ſuch a place, and remain in the bath, or ſurrounded with warm grains, for three or four hours.

If a child has been drowned, its body ſhould be wiped perfectly dry, and immediately placed in bed between two healthy perſons. The ſalutary effects of the natural vital warmth, conveyed in this manner, have been proved in a variety of ſucceſsful caſes.

X. While the various methods of treatment are employed, the body is to be well ſhaken every ten minutes, in order to render the proceſs of animation more certainly ſucceſsful; and children, in particular, are to be much agitated, by taking hold of their legs and arms frequently and for a continuance of time. In various inſtances agitation has forwarded the recovery of boys who have been drowned, and continued for a conſiderable time apparently dead.

XI. If there be any ſigns of returning life, ſuch as ſighing, gaſping, or convulſive motions, a ſpoonful of any warm liquid may be adminiſtered; and if the act of ſwallowing is returned, then a cordial of warm brandy or wine may be given in ſmall quantities and frequently repeated.

XII. Electricity may be tried by the judicious and ſkilful, as its application neither prevents nor retards the various modes of recovery already recommended; but, on the other hand, will moſt probably tend to render the other means employed more certainly and more expeditiouſly efficacious. This ſtimulus bids fair to prove an important auxiliary in caſes of ſuſpended animations; and therefore deſerves the ſerious regard and attention of the Faculty.

The methods which have been fully deſcribed, are to be employed with vigour for three hours or upwards, although no favourable circumſtances ſhould ariſe; for it is a vulgar and dangerous opinion to ſuppoſe that perſons are irrecoverable, becauſe life does not ſoon make its appearance; an opinion that has conſigned to the grave an immenſe number of the ſeemingly dead, who might have been reſtored to life by reſolution and perſeverance.

Bleeding is never to be employed in ſuch caſes, unleſs by the direction of one of the medical aſſiſtants, or ſome other gentleman of the faculty who has paid attention to the reſuſcitating art.

DRUG, a general term for goods of the druggiſt and grocery kinds, eſpecially thoſe uſed in medicine and dyeing. See MATERIA MEDICA, PHARMACY, and DYEING.

DRUGGET, in commerce, a ſtuff ſometimes all wool, and ſometimes half wool half thread, ſometimes corded, but uſually plain. Thoſe that have the woof of wool, and the warp of thread, are called *threaded druggets*; and thoſe wrought with the ſhuttle on a loom of four marches, as the ſerges of Moui, Beauvois, and other like ſtuffs corded, are called *corded druggets*. As to the plain, they are wrought on a loom of two marches, with the ſhuttle, in the ſame manner as cloth, camblets, and other like ſtuffs not corded.

DRUIDÆ, or DROIUM (anc. geog.), a very ancient town, the principal place of the Druides or Druidæ in Gaul, as they are called (Cæſar, Cicero). Now *Dreux* in the Orleannois. Here they met every year in a conſecrated grove, according to Cæſar. The town was alſo called *Durocaſes*. W. Long. 1. 21. Lat. 48. 45.

DRUIDS, DRUIDES, or DRUIDÆ, the prieſts or miniſters of religion among the ancient Celtæ or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרושים. *deruſſim*, or *druſſim*, which they tranſlate *contemplatores*. Picard, Celtopæd. lib. ii. p. 58. believes the druids to have been thus called from *Druis*, or *Dryius*, their leader, the fourth or fifth king of the Gauls,

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(A) Dr Fothergill of Bath, in a letter to the Regiſter, adviſes as a potent and active ſtimulus the patent muſtard moiſtened with ſpirits.

Gauls, and father of Saron or Naumes. Pliny, Salmaſius, Vigenere, &c. derive the name from δρυς, *oak;* on account of their inhabiting, or at leaſt frequenting, and teaching in foreſts; or perhaps becauſe, as Pliny ſays, they never ſacrificed but under the oak. But it is hard to imagine how the druids ſhould come to ſpeak Greek. Menage derives the word from the old Britiſh *drus*, "dæmon, magician." Borel, from the Saxon *dry*, "magician;" or rather from the old Britiſh *dru*, or *derw*, "oak," whence he takes δρυς to be derived; which is the moſt probable ſuppoſition. Gorop. Becanus, lib. i. takes *druis* to be an old Celtic and German word, formed from *trowis* or *truwis*, "a doctor of the truth and the faith;" which etymology Voſſius acquieſces in.

1
General account of the druids.

The druids were the firſt and moſt diſtinguiſhed order among the Gauls and Britons; they were choſen out of the beſt families; and the honours of their birth, joined with thoſe of their function, procured them the higheſt veneration among the people. They were verſed in aſtrology, geometry, natural philoſophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever refuſed obedience to them was declared impious and accurſed. We know but little as to their peculiar doctrines; only that they believed the immortality of the ſoul; and, as is generally alſo ſuppoſed, the metempſychoſis; though a late author makes it appear highly probable they did not believe this laſt, at leaſt not in the ſenſe of the Pythagoreans.

The chief ſettlement of the druids in Britain was in the iſle of Angleſey, the ancient *Mona*, which they might chooſe for this purpoſe, as it is well ſtored with ſpacious groves of their favourite oak. They were divided into ſeveral claſſes or branches, viz. the *vacerri*, *bardi*, *eubages*, *ſemnothii* or *ſemnothei*, and *ſaronidæ*. The *vacerri* are held to have been the prieſts; the *bardi*, the poets; the *eubages*, the augurs; and the *ſaronidæ*, the civil judges and inſtructors of youth. As to the *ſemnothei*, who are ſaid to have been immediately devoted to the ſervice of religion, it is probable they were the ſame with the *vacerri*. Strabo, however, (lib. iv. p. 197.) and Picard after him in his Celtopœdia, do not comprehend all theſe different orders under the denomination of druids, as ſpecies under their genus, or parts under the whole; but make them quite different conditions or orders. Strabo, in effect, only diſtinguiſhes three kinds; *bardi*, *vates*, and *druids*. The *bardi* were the poets; the *vates*, υατεις (apparently the ſame with the *vacerri*), were the prieſts and naturaliſts; and the *druids*, beſide the ſtudy of nature, applied themſelves likewiſe to morality.

Diogenes Laertius aſſures us, in his Prologue, that the druids were the ſame among the ancient Britons with the ſophi or philoſophers among the Greeks; the magi among the Perſians; the gymnoſophiſts among the Indians; and the Chaldeans among the Aſſyrians.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white ſurplice. They generally carried a wand in their hands; and wore a kind of ornament enchaſed in gold about their necks, called the *druid's egg*. Their necks were likewiſe decorated with gold chains, and their hands and arms with bracelets: they wore their hair very ſhort, and their beards remarkably long.

The druids had one chief, or arch-druid, in every nation, who acted as high-prieſt, or *pontifex maximus*. He had abſolute authority over the reſt; and commanded, decreed, puniſhed, &c. at pleaſure. At his death he was ſucceeded by the moſt conſiderable among his ſurvivors; and, if there were ſeveral pretenders, the matter was ended by an election, or elſe put to the deciſion of arms.

The druids, we have obſerved, were in the higheſt eſteem. They preſided at ſacrifices, and other ceremonies; and had the direction of every thing relating to religion. The Britiſh and Gauliſh youth flocked to them in crowds, to be inſtructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the moſt deſolate parts of foreſts, and kept them there ſometimes for twenty years under their diſcipline. Beſide the immortality and metempſychoſis, they were here inſtructed in the motion of the heavens, and the courſe of the ſtars; the magnitude of the heavens and the earth; the nature of things; the power and wiſdom of the gods, &c. They preſerved the memory and actions of great men in their verſes, which they never allowed to be wrote down, but made their pupils get them by heart. In their common courſe of learning, they are ſaid to have taught them twenty-four thouſand ſuch verſes. By this means their doctrines appeared more myſterious by being unknown to all but themſelves; and having no books to recur to, they were the more careful to fix them in their memory.

They worſhipped the Supreme Being under the name of *Eſus*, or *Heſus*, and the ſymbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any perſon admitted to enter that ſacred receſs, unleſs he carried with him a chain, in token of his abſolute dependence on the Deity. Indeed, their whole religion originally conſiſted in acknowledging, that the Supreme Being, who made his abode in theſe ſacred groves, governed the univerſe; and that every creature ought to obey his laws, and pay him divine homage.

They conſidered the oak as the emblem, or rather the peculiar reſidence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people in their religious ceremonies, the altars were ſtrewed with its leaves and encircled with its branches. The fruit of it, eſpecially the miſletoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was therefore ſought for on the ſixth day of the moon with the greateſt earneſtneſs and anxiety; and when found was hailed with ſuch raptures of joy, as almoſt exceeds imagination to conceive. As ſoon as the druids were informed of this fortunate diſcovery, they prepared every thing ready for the ſacrifice under the oak, to which they faſtened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, aſcended the tree, dreſſed in white; and with a conſecrated golden knife, or pruning hook, cropped the miſletoe, which he received in his ſagum or robe, amidſt the rapturous exclamations of the people. Having ſecured this ſacred plant, he deſcended the tree; the bulls were ſacrificed; and the Deity invoked to bleſs his own gift, and render it efficacious in thoſe diſtempers in which it ſhould be adminiſtered.

The conſecrated groves, in which they performed their religious rites, were fenced round with ſtones, to prevent any perſon's entering between the trees, except through the paſſages left open for that purpoſe, and which were guarded by ſome inferior druids, to prevent any ſtranger from intruding into their myſteries. Theſe groves were of different forms; ſome quite circular, others oblong, and more or leſs capacious as the votaries in the diſtricts to which they belonged were more or leſs numerous. The area in the centre of the grove was encompaſſed with ſeveral rows of large oaks ſet very cloſe together. Within this large circle were ſeveral ſmaller ones ſurrounded with large ſtones; and near the centre of theſe ſmaller circles, were ſtones of a prodigious ſize and convenient height, on which the victims were ſlain and offered. Each of theſe being a kind of altar, was ſurrounded with another row of ſtones, the uſe of which cannot now be known, unleſs they were intended as cinctures to keep the people at a convenient diſtance from the officiating prieſt.

Suetonius, in his life of Claudius, aſſures us the druids ſacrificed men; and Mercury is ſaid to be the god to whom they offered theſe victims. Diod. Siculus, lib. vi. obſerves it was only upon extraordinary occaſions they made ſuch offerings; as, to conſult what meaſures to take, to learn what ſhould befal them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood guſhing out. Auguſtus condemned the cuſtom, and Tiberius and Claudius puniſhed and aboliſhed it.

We learn from Cæſar, that the druids were the judges and arbiters of all differences and diſputes, both public and private: they took cognizance of murders, inheritances, boundaries, and limits; and decreed rewards and puniſhments. Such as diſobeyed their deciſions they excommunicated, which was their principal puniſhment; the criminal being hereby excluded from all public aſſemblies, and avoided by all the world; ſo that nobody durſt ſpeak to him for fear of being polluted. Strabo obſerves, they had ſometimes intereſt and authority enough to ſtop armies upon the point of engaging, and accommodate their differences.

2
Their opinions and philoſophy, whence derived.

It hath been diſputed, whether the druids were themſelves the inventors of their opinions and ſyſtems of religion and philoſophy, or received them from others. Some have imagined, that the colony of Phocians which left Greece and built Marſeilles in Gaul about the 57th Olympiad, imported the firſt principles of learning and philoſophy, and communicated them to the Gauls and other nations in the weſt of Europe. It appears, indeed, that this famous colony contributed not a little to the improvement of that part of Gaul where it ſettled, and to the civilization of its inhabitants. "The Greek colony of Marſeilles (ſays Juſtin) civilized the Gauls, and taught them to live under laws; to build cities and incloſe them with walls; to raiſe corn; to cultivate the vine and olive; and, in a word, made ſo great a change both in the face of the country and the manners of its inhabitants, that Gaul ſeemed to be tranſlated into Greece, rather than a few Greeks tranſplanted into Gaul." But though we may allow that the druids of Gaul and Britain borrowed ſome hints and embelliſhments of their philoſophy from this Greek colony, and perhaps from other quarters, we have reaſon to believe that the ſubſtance of it was their own. Others have ſuggeſted, that the druids derived their philoſophy from Pythagoras, who publiſhed his doctrines at Crotona in Italy; where he lived in the higheſt reputation for his virtue, wiſdom, and learning, above 20 years. This conjecture is very much confirmed by this remarkable expreſſion of Ammianus Marcellinus, "That the druids were formed into fraternities, as the authority of Pythagoras decreed." It hath been alſo obſerved, that the philoſophy of the druids bore a much greater reſemblance to that of Pythagoras than to that of any of the other ſages of antiquity. But it ſeems probable, that Ammianus meant no more by the above expreſſion than to illuſtrate the nature of the druidical fraternities, by comparing them to thoſe of the Pythagoreans, which were well known to the Romans; and the reſemblance between the Pythagorean and druidical philoſophy may perhaps be beſt accounted for by ſuppoſing, that Pythagoras learned and adopted ſome of the opinions of the druids, as well as imparted to them ſome of his diſcoveries. It is well known, that this philoſopher, animated by the moſt ardent love of knowledge, travelled into many countries in purſuit of it, and got himſelf admitted into every ſociety that was famous for its learning. It is therefore highly probable in itſelf, as well as directly aſſerted by ſeveral authors, that Pythagoras heard the druids of Gaul, and was initiated into their philoſophy.

3
More particular account of the learning of the druids.

4
Phyſics, or natural philoſophy.

From the concurring teſtimonies of ſeveral authors, it appears that phyſiology, or natural philoſophy, was the favourite ſtudy of the druids of Gaul and Britain. Cicero tells us, that he was perſonally acquainted with one of the Gauliſh druids, Divitiacus the Æduan, a man of quality in his country, who profeſſed to have a thorough knowledge of the laws of nature, or that ſcience which the Greeks call *phyſics* or *phyſiology*. According to Diodorus Siculus, Strabo, Cæſar, Mela, Ammianus Marcellinus, and others, they entered into many diſquiſitions and diſputations in their ſchools, concerning the form and magnitude of the univerſe in general, and of this earth in particular, and even concerning the moſt ſublime and hidden ſecrets of nature. On theſe and the like ſubjects they formed a variety of ſyſtems and hypotheſes; which they delivered to their diſciples in verſe, that they might the more eaſily retain them in their memories, ſince they were not allowed to commit them to writing. Strabo hath preſerved one of the phyſiological opinions of the druids concerning the univerſe; *viz.* that it was never to be entirely deſtroyed or annihilated; but was to undergo a ſucceſſion of great changes and revolutions, which were to be produced ſometimes by the power and predominancy of water, and ſometimes by that of fire. This opinion, he intimates, was not peculiar to them, but was entertained alſo by the philoſophers of other nations; and Cicero ſpeaks of it as a truth univerſally acknowledged and undeniable. "It is impoſſible for us (ſays he) to attain a glory that is eternal, or even of very long duration, on account of thoſe deluges and conflagrations of the earth which muſt neceſſarily happen at certain periods." This opinion, which was entertained by the moſt ancient philoſophers of many different and very diſtant nations, was probably neither the reſult of rational inquiry in all theſe nations, nor communicated from one of them to others; but deſcended to them all from their common anceſtors of the family of Noah by tradition, but corrupted and miſunderſtood through length of time. The agreement of the druids with the philoſophers of ſo many other nations in this opinion about the alternate diſſolution and renovation of the world, gives us reaſon to believe, that they agreed with them alſo in their opinion of its origin from two diſtinct principles; the one intelligent and omnipotent, which was God; the other inanimate and inactive, which was matter. We are told by Cæſar, that they had many diſquiſitions about the power of God; and, no doubt, amongſt other particulars, about his creating power. But whether they believed with ſome that matter was eternal, or with others that it was created; and in what manner they endeavoured to account for the diſpoſition of it into the preſent form of the univerſe, we are entirely ignorant, though they certainly had their ſpeculations on theſe ſubjects. We are only informed, that they did not expreſs their ſentiments on theſe and the like heads in a plain and natural, but in a dark, figurative, and enigmatical manner. This might incline us to ſuſpect, that Pythagoras had borrowed from them his doctrine about numbers, to whoſe myſtical energy he aſcribes the formation of all things; for nothing can be more dark and enigmatical than that doctrine. The druids diſputed likewiſe about the magnitude and form of the world in general, and of the earth in particular, of which things they pretended to have a perfect knowledge. We know not what their opinions were about the dimenſions of the univerſe or of the earth, but we have ſeveral reaſons to make us imagine that they believed both to be of a ſpherical form. This is viſibly the ſhape and form of the ſun, moon, and ſtars, the moſt conſpicuous parts of the univerſe; from whence it was natural and eaſy to infer, that this was the form of the world and of the earth. Accordingly this ſeems to have been the opinion of the philoſophers of all nations; and the circle was the favourite figure of the druids, as appears from the form both of their houſes and places of worſhip. Beſides theſe general ſpeculations about the origin, diſſolution, magnitude, and form of the world and of the earth, the druids engaged in particular inquiries into the natures and properties of the different kinds of ſubſtances. But all their diſcoveries in this moſt uſeful and extenſive branch of natural philoſophy, whatever they were, are entirely loſt.

5 Aſtronomy. Aſtronomy alſo appears to have been one of the chief ſtudies of the druids of Gaul and Britain. "The druids (ſays Cæſar) have many diſquiſitions concerning the heavenly bodies and their motions, in which they inſtruct their diſciples." Mela, ſpeaking of the ſame philoſophers, obſerves, "That they profeſs to have great knowledge of the motions of the heavens and of the ſtars." Some knowledge of this ſcience indeed was not only neceſſary for meaſuring time in general, marking the duration of the different ſeaſons, regulating the operations of the huſbandman, directing the courſe of the mariner, and for many other purpoſes in civil life; but it was eſpecially neceſſary for fixing the times and regular returns of their religious ſolemnities, of which the druids had the ſole direction. Some of theſe ſolemnities were monthly, and others annual. It was therefore neceſſary for them to know, with ſome tolerable degree of exactneſs, the number of days in which the ſun and moon performed their revolutions, that theſe ſolemnities might be obſerved at their proper ſeaſons. This was the more neceſſary, as ſome of theſe ſolemnities were attended by perſons from different and very diſtant countries, who were all to meet at one place on one day; who muſt have had ſome rule to diſcover the annual return of that day.

6 Their method of computing time. The moſt perceptible diviſion of time by the two great luminaries is into day and night; the former occaſioned by the preſence of the ſun above the horizon, the latter by his abſence, which is in ſome meaſure ſupplied by the moon and ſtars. The druids computed their time by nights, and not by days; a cuſtom which they had received from their moſt remote anceſtors by tradition, and in which they were confirmed by their meaſuring their time very much by the moon, the miſtreſs and queen of night. As the changes in the aſpect of that luminary are moſt conſpicuous, they engaged the attention of the moſt ancient aſtronomers of all countries, and particularly of the druids, who regulated all their great ſolemnities, both ſacred and civil, by the age and aſpect of the moon. "When no unexpected accident prevents it, they aſſemble upon ſtated days, either at the time of the new or full moon; for they believe theſe to be the moſt auſpicious times for tranſacting all affairs of importance." Their moſt auguſt ceremony of cutting the miſletoe from the oak by the archdruid, was always performed on the ſixth day of the moon. Nay, they even regulated their military operations very much by this luminary, and avoided, as much as poſſible, to engage in battle while the moon was on the wane. As the attention of the druids was ſo much fixed on this planet, it could not be very long before they diſcovered that ſhe paſſed through all her various aſpects in about thirty days; and by degrees, and more accurate obſervations, they would find, that the real time of her performing an entire revolution was very nearly 29½ days. This furniſhed them with the diviſion of their time into months, or revolutions of the moon; of which we know with certainty they were poſſeſſed. But this period, though of great uſe, was evidently too ſhort for many purpoſes, and particularly for meaſuring the ſeaſons; which they could not fail to perceive depended on the influences of the ſun. By continued obſervation they diſcovered, that about 12 revolutions of the moon included all the variety of ſeaſons, which begun again, and revolved every 12 months. This ſuggeſted to them that larger diviſion of time called a year, conſiſting of 12 lunations, or 354 days, which was the moſt ancient meaſure of the year in almoſt all nations. That this was for ſome time at leaſt the form of the druidical year, is both probable in itſelf, and from the following expreſſion of Pliny: "That they begun both their months and years, not from the change, but from the ſixth day of the moon." This is even a demonſtration that their years conſiſted of a certain number of lunar revolutions, as they always commenced on the ſame day

of the moon. But as this year of 12 lunar months falls 11 days and nearly one-fourth of a day ſhort of a real revolution of the ſun, this error would ſoon be perceived, and call for reformation; though we are not informed of the particular manner in which it was rectified. Various arguments might be collected to make it very probable that the Britons were acquainted with a year exact enough for every purpoſe of life, when they were firſt invaded by the Romans; but it will be ſufficient to mention one, which is taken from the time and circumſtances of that invaſion. The learned Dr Halley hath demonſtrated that Cæſar arrived in Britain, in his firſt year's expedition, on the 26th day of Auguſt: and Cæſar himſelf informs us, that at his arrival the harveſt was finiſhed, except in one field, which by ſome means or other was more backward than the reſt of the country. This is a proof that the Britiſh huſbandmen knew and uſed the moſt proper ſeaſons for ploughing, ſowing, and reaping. The druids, as we are told by Pliny, had alſo a cycle or period of 30 years, which they called an age, and which commenced likewiſe on the ſixth day of the moon; but that author hath not acquainted us on what principles this cycle was formed, nor to what purpoſes it was applied. We can hardly ſuppoſe that this was the cycle of the ſun, which conſiſts of 28 years, and regulates the dominical letters. It is more probable, that while the druids made uſe of the year of 12 lunar months, and had not invented a method of adjuſting it to the real revolution of the ſun, they obſerved that the beginning of this year had paſſed through all the ſeaſons, and returned to the point from whence it ſet out, in a courſe of about 33 years; which they might therefore call an age. Others may perhaps be of opinion, that this 30 years cycle of the druids is the ſame with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the druids were alſo acquainted with the cycle of 19 years, which is commonly called the cycle of the moon. But the evidence of this depends entirely on the truth of that ſuppoſition, that the Hyperborean iſland, which is deſcribed by Diodorus Siculus, was Britain, or ſome of the Britiſh iſles. Among many other ſurpriſing things, that author ſays, concerning this Hyperborean iſland, "That its inhabitants believed that Apollo deſcended into their iſland at the end of every 19 years; in which period of time the ſun and moon, having performed their various revolutions, return to the ſame point, and begin to repeat the ſame revolutions. This is called by the Greeks the great year, or the cycle of Meton."

7
Their knowledge of the ſtars.

We are told both by Cæſar and Mela, that the druids ſtudied the ſtars as well as the ſun and moon; and that they profeſſed to know, and taught their diſciples, many things concerning the motions of theſe heavenly bodies. From theſe teſtimonies we may conclude that the druids were acquainted with the planets, diſtinguiſhed them from the fixed ſtars, and carefully obſerved their motions and revolutions. If this diſcovery was the reſult of their own obſervations, it would be gradual, and it would be a long time before they found out all the planets. They might perhaps have received ſome aſſiſtance and information from Pythagoras, or from ſome other quarter. But whether this diſcovery of the planets was their own, or communicated to them by others, it is highly probable that they were acquainted with the preciſe number of theſe wandering ſtars. Dio Caſſius ſays, that the cuſtom of giving the name of one of the planets to each of the ſeven days of the week was an invention of the Egyptians, and from them was gradually communicated to all the other nations of the world; and that in his time this cuſtom was ſo firmly eſtabliſhed, not only among the Romans, but among all the reſt of mankind, that in every country it appeared to be a native inſtitution. The knowledge of the planets, and perhaps the cuſtom of giving their names to the days of the week, was brought out of Egypt into Italy by Pythagoras, more than 500 years before the beginning of the Chriſtian era; and from thence it could not be very long before it reached Gaul and Britain. But though we have little or no reaſon to doubt that the druids knew the number and obſerved the motion of the planets, yet it may be queſtioned whether they had diſcovered the times in which they performed their ſeveral revolutions. Some of theſe ſtars, as Jupiter and Saturn, take ſo great a number of years in revolving, that it required a very extraordinary degree of patience and attention to diſcover the preciſe periods of their revolutions. If we could be certain that the iſland in which the ancients imagined Saturn lay aſleep, was one of the Britiſh iſles, as Plutarch intimates it was, we might be inclined to think that the Britiſh druids were not ignorant of the length of the period in which the planet Saturn performs a revolution. For that ſame author, in another treatiſe, tells us, "That the inhabitants of that iſland kept every thirtieth year a ſolemn feſtival in honour of Saturn, when his ſtar entered into the ſign of Taurus."

If we could depend upon the above teſtimony of Plutarch, we ſhould have one poſitive proof that the druids of the Britiſh iſles were acquainted with the conſtellations, and even with the ſigns of the zodiac; and that they meaſured the revolutions of the ſun and planets, by obſerving the length of time between their departure from and return to one of theſe ſigns. But we have no direct evidence of this remaining in hiſtory.

The druids of Gaul and Britain, as well as the ancient philoſophers of other countries, had a general plan or ſyſtem of the univerſe, and of the diſpoſition and arrangement of its various parts, in which they inſtructed their diſciples. This is both probable in itſelf, and is plainly intimated by ſeveral authors of the greateſt authority. But we cannot be certain whether this druidical ſyſtem of the world was of their own invention, or was borrowed from others. If it was borrowed, it was moſt probably from the Pythagoreans, to whom they were the neareſt neighbours, and with whom they had the greateſt intercourſe.

It hath been imagined, that the druids had inſtruments of ſome kind or other, which anſwered the ſame purpoſes with our teleſcopes, in making obſervations on the heavenly bodies. The only foundation of this very improbable conjecture is an expreſſion of Diodorus Siculus, in his deſcription of the famous Hyperborean iſland. They ſay further, that the moon is ſeen from that ſland, as if ſhe was but at a little diſtance from the earth, and having hills or mountains like ours on her ſurface. But no ſuch inference can be reaſonably drawn from this expreſſion, which in reality merits little more regard than what Strabo reports was ſaid of ſome of the inhabitants of Spain: "That they heard the hiſſing noiſe of the ſun every evening when he fell into the weſtern ocean."

The application of the druids to the ſtudy of philoſophy and aſtronomy amounts almoſt to a demonſtration that they applied alſo to the ſtudy of arithmetic and geometry. For ſome knowledge of both theſe ſciences is indiſpenſably neceſſary to the phyſiologiſt and aſtronomer, as well as of great and daily uſe in the common affairs of life.

8 **Arithmetic**

If we were certain that Abaris, the famous Hyperborean philoſopher, the friend and ſcholar of Pythagoras, was really a Britiſh druid, as ſome have imagined, we ſhould be able to produce direct hiſtorical evidence of their arithmetic knowledge. For Iamblicus, in the life of Pythagoras, ſays, "that he taught Abaris to find out all truth by the ſcience of arithmetic." It may be thought improbable that the druids had made any conſiderable progreſs in arithmetic, as this may ſeem to be impoſſible by the mere ſtrength of memory without the aſſiſtance of figures and of written rules. But it is very difficult to aſcertain what may be done by memory alone, when it hath been long exerciſed in this way. We have had an example in our own age, of a perſon * who could perform ſome of the moſt tedious and difficult operations in arithmetic by the mere ſtrength of his memory. The want of written rules could be no great diſadvantage to the druids, as the precepts of this, as well as of the other ſciences, were couched in verſe, which would be eaſily got by heart and long remembered. Though the druids were unacquainted with the Arabic characters which are now in uſe, we have no reaſon to ſuppoſe that they were deſtitute of marks or characters of ſome other kind, which, in ſome meaſure, anſwered the ſame purpoſes, both in making and recording their calculations. In particular, we have reaſon to think, that they made uſe of the letters of the Greek alphabet for both theſe purpoſes. This ſeems to be plainly intimated by Cæſar in the following expreſſion concerning the druids of Gaul: "In almoſt all other public tranſactions, and private accounts or computations, they make uſe of the Greek letters." This is further confirmed by what the ſame author ſays of the Helvetii; a people of the ſame origin, language, and manners, with the Gauls and Britons. "Tables were found in the camp of the Helvetii written in Greek letters, containing an account of all the men capable of bearing arms, who had left their native country, and alſo ſeparate accounts of the boys, old men, and women." There is hiſtorical evidence of the druids being alſo well acquainted with geometry. "When any diſputes ariſe (ſays Cæſar) about their inheritances, or any controverſies about the limits of their fields, they are entirely referred to the deciſion of their druids." But beſides the knowledge of menſuration which this implies, both Cæſar and Mela plainly intimate that the druids were converſant in the moſt ſublime ſpeculations of geometry; "in meaſuring the magnitude of the earth, and even of the world."

9 **Skill in mechanics.**

There are ſtill many monuments remaining in Britain and the adjacent iſles, which cannot ſo reaſonably be aſcribed to any as to the ancient Britons, and which give us cauſe to think, that they had made great progreſs in this uſeful part of learning, and could apply the mechanical powers ſo as to produce very aſtoniſhing effects. As theſe monuments appear to have been deſigned for religious purpoſes, we may be certain that they were erected under the direction of the druids. How many obeliſks or pillars, of one rough unpoliſhed ſtone each, are ſtill to be ſeen in Britain and its iſles? Some of theſe pillars are both very thick and lofty, erected on the ſummits of barrows and of mountains; and ſome of them (as at Stonehenge) have ponderous blocks of ſtone raiſed aloft, and reſting on the tops of the upright pillars. We can hardly ſuppoſe that it was poſſible to cut theſe prodigious maſſes of ſtone (ſome of them above forty tons in weight) without wedges, or to raiſe them out of the quarry without levers. But it certainly required ſtill greater knowledge of the mechanical powers, and of the method of applying them, to tranſport thoſe huge ſtones from the quarry to the places of their deſtination; to erect the perpendicular pillars, and to elevate the impoſts to the tops of theſe pillars. If that prodigious ſtone in the pariſh of Conſtantine, Cornwal, was really removed by art from its original place, and fixed where it now ſtands (as one of our moſt learned and diligent antiquaries thinks it was †), it is a demonſtration, that the druids could perform the moſt aſtoniſhing feats by their ſkill in mechanics. That the Britiſh druids were acquainted with the principles and uſe of the balance, we have good reaſon to believe, not only from the great antiquity of that diſcovery in other parts of the world, but alſo from ſome druidical monuments which are ſtill remaining in this iſland. Theſe monuments are called *Logan ſtones*, or rocking ſtones; and each of them conſiſts of one prodigious block of ſtone, reſting upon an upright ſtone or rock, and ſo equally balanced, that a very ſmall force, ſometimes even a child, can move it up and down, though hardly any force is ſufficient to remove it from its ſtation. Some of theſe ſtones may have fallen into this poſition by accident, but others of them evidently appear to have been placed in it by art. That the ancient Britons underſtood the conſtitution and uſe of wheels, the great number of their war-chariots and other wheel-carriages is a ſufficient proof; and that they knew how to combine them together and with the other mechanical powers, ſo as to form machines capable of raiſing and tranſporting very heavy weights, we have good reaſon to believe. In a word, if the Britiſh druids were wholly ignorant of the principles and uſe of any of the mechanical powers, it was moſt probably of the ſcrew, though even of this we cannot be certain.

10 **Medicine.**

In Germany and in the northern nations of Europe the healing art was chiefly committed to the old women of every ſtate; but in Gaul and Britain it was intruſted to the druids, who were the phyſicians as well as the prieſts of theſe countries. Pliny ſays expreſsly, "That Tiberius Cæſar deſtroyed the druids of the Gauls, who were the poets and phyſicians of that nation;" and he might have added of the Britons. The people of Gaul and Britain were probably induced to devolve the care of their health on the druids, and to apply to theſe prieſts for the cure of their diſeaſes, not only by the high eſteem they had of their wiſdom and learning, but alſo by the opinion which they entertained,

* See Buxton (*Jedediah*).

† Dr Borlaſe's Antiq. Cornwal. p. 174, 175.

tertained, that a very intimate connection ſubſiſted between the arts of healing and the rites of religion, and that the former were moſt effectual when they were accompanied by the latter. It appears indeed to have been the prevailing opinion of all the nations of antiquity, that all internal diſeaſes proceeded immediately from the anger of the gods; and that the only way of obtaining relief from theſe diſeaſes was by applying to their prieſts to appeaſe their anger by religious rites and ſacrifices. This was evidently the opinion and practice of the Gauls and Britons, who in ſome dangerous caſes ſacrificed one man as the moſt effectual means of curing another. "They are much addicted (ſays Cæſar) to ſuperſtition; and for this cauſe, thoſe who are afflicted with a dangerous diſeaſe ſacrifice a man, or promiſe that they will ſacrifice one, for their recovery. For this purpoſe they make uſe of the miniſtry of the druids; becauſe they have declared, that the anger of the immortal gods cannot be appeaſed, ſo as to ſpare the life of one man but by the life of another." This way of thinking gave riſe alſo to that great number of magical rites and incantations with which the medical practices of the druids, and indeed of all the phyſicians of antiquity, were attended. "No body doubts (ſays Pliny) that magic derived its origin from medicine, and that by its flattering but deluſive promiſes, it came to be eſteemed the moſt ſublime and ſacred part of the art of healing."

XI
Botany.

That the druids made great uſe of herbs for medicinal purpoſes, we have ſufficient evidence. They not only had a moſt ſuperſtitious veneration for the miſletoe of the oak, on a religious account, but they alſo entertained a very high opinion of its medical virtues, and eſteemed it a kind of panacea or remedy for all diſeaſes. "They call it (ſays Pliny) by a name which in their language ſignifies *Albeal*, becauſe they have an opinion that it cureth all diſeaſes." They believed it to be in particular a ſpecific againſt barrenneſs, and a ſovereign antidote againſt the fatal effects of poiſons of all kinds. It was eſteemed alſo an excellent emollient and diſcutient for ſoftening and diſcuſſing hard tumors; good for drying up ſcrophulous ſores; for curing ulcers and wounds; and (provided it was not ſuffered to touch the earth after it was cut) it was thought to be a very efficacious medicine in the epilepſy or falling-ſickneſs. It hath been thought uſeful in this laſt calamitous diſeaſe by ſome modern phyſicians. The pompous ceremonies with which the miſletoe was gathered by the druids have been already deſcribed. The ſelago, a kind of hedge hyſſop reſembling ſavin, was another plant much admired by the druids of Gaul and Britain for its ſuppoſed medicinal virtues, particularly in all diſeaſes of the eyes. But its efficacy, according to them, depended very much upon its being gathered exactly in the following manner: The perſon who gathered it was to be clothed in a white robe, to have his feet bare, and waſhed in pure water; to offer a ſacrifice of bread and wine before he proceeded to cut it; which he was to do with his right hand covered with the ſkirt of his garment, and with a hook of ſome more precious metal than iron. When it was cut, it was to be received into, and kept in a new and very clean cloth. When it was gathered exactly according to this whimſical ritual, they affirmed that it was not only an excellent medicine, but alſo a powerful charm and preſervative from misfortunes and unhappy accidents of all kinds. They entertained a high opinion alſo of the herb Samolus or marſhwort, for its ſanative qualities; and gave many directions for the gathering it, no leſs fanciful than thoſe above mentioned. The perſon who was to perform that office was to do it faſting, and with his left hand; he was on no account to look behind him, nor to turn his face from the herbs he was gathering. It would be tedious to relate the extravagant notions they entertained of the many virtues of the vervain, and to recount the ridiculous mummeries which they practiſed in gathering and preparing it, both for the purpoſes of divination and phyſic. Theſe things may be ſeen in Plin. Hiſt. Nat. l. 25. c. 9. from whence we have received all theſe anecdotes of the botany of the druids. It is eaſy to ſee that his information was very imperfect; and that, like many of the other Greek and Roman writers, he deſignedly repreſents the philoſophers of Gaul and Britain in an unfavourable light. The herb which was called *Britannica* by the ancients, which ſome think was the great water-dock, and others the cochlearea, or ſcurvy-graſs, was probably much uſed in this iſland for medical purpoſes; as it derived its name from hence, and was from hence exported to Rome and other parts. Though theſe few imperfect hints are all that we can now collect of the botany of the Britiſh druids, yet we have ſome reaſon to think that they were not contemptible botaniſts. Their circumſtances were peculiarly favourable for the acquiſition of this kind of knowledge. For as they ſpent moſt of their time in the receſſes of mountains, groves, and woods, the ſpontaneous vegetable productions of the earth conſtantly preſented themſelves to their view, and courted their attention.

The opinions which, it is ſaid, the druids of Gaul and Britain entertained of their anguinum or ſerpents egg, both as a charm and as a medicine, are romantic and extravagant in a very high degree. This extraordinary egg was formed, as they pretended, by a great number of ſerpents interwoven and twined together; and when it was formed, it was raiſed up in the air by the hiſſing of theſe ſerpents, and was to be catched in a clean white cloth, before it fell to the ground. The perſon who catched it was obliged to mount a ſwift horſe, and to ride away at full ſpeed to eſcape from the ſerpents, who purſued him with great rage, until they were ſtopped by ſome river. The way of making trial of the genuineneſs of this egg was no leſs extraordinary. It was to be enchaſed in gold, and thrown into a river, and if it was genuine it would ſwim againſt the ſtream. "I have ſeen (ſays Pliny) that egg; it is about the bigneſs of a moderate apple, its ſhell is a cartilaginous incruſtation, full of little cavities, ſuch as are on the legs of the polypus; it is the inſignia, or badge of diſtinction of the druids." The virtues which they aſcribed to this egg were many and wonderful. It was particularly efficacious to render thoſe who carried it about with them ſuperior to their adverſaries in all diſputes, and to procure them the favour and friendſhip of great men. Some have thought that this whole affair of the ſerpents egg was a mere fraud, contrived by the druids, to excite the admiration and pick the pockets of credulous people, who purchaſed theſe wonder-working eggs from them

as

at a high price. Others have imagined that this ſtory of the anguinum (of which there is an ancient monument in the cathedral at Paris) was an emblematical repreſentation of the doctrine of the druids concerning the creation of the world. The ſerpents, ſay they, repreſent the Divine Wiſdom forming the univerſe, and the egg is the emblem of the world formed by that Wiſdom. It may be added, that the virtue aſcribed to the anguinum, of giving thoſe who poſſeſſed it a ſuperiority over others, and endearing them to great men, may perhaps be intended to repreſent the natural effects of learning and philoſophy. But in ſo doubtful a matter every one is at full liberty to form what judgment he thinks proper.

12 Rhetoric. As the influence and authority of the druids in their country depended very much upon the reputation of their ſuperior wiſdom and learning, they wiſely applied to the ſtudy of thoſe ſciences which moſt directly contributed to the ſupport and advancement of that reputation. In this number, beſides thoſe already mentioned, we may juſtly reckon rhetoric, which was diligently ſtudied and taught by the druids of Gaul and Britain; who to the charms of their eloquence were indebted for much of the admiration and authority which they enjoyed. They had indeed many calls and opportunities to diſplay their eloquence, and to diſcover its great power and efficacy; as, when they were teaching their pupils in their ſchools, when they diſcourſed in public to the people on religious and moral ſubjects, when they pleaded cauſes in the courts of juſtice, and when they harangued in the great councils of the nation, and at the heads of armies ready to engage in battle; ſometimes with a view to inflame their courage, and at other times with a deſign to allay their fury, and diſpoſe them to make peace. Though this laſt was certainly a very difficult taſk among fierce and warlike nations, yet ſuch was the authority and eloquence of the druids that they frequently ſucceeded in it. "They pay a great regard (ſays Diodorus Siculus) to their exhortations, not only in the affairs of peace, but even of war, and theſe are reſpected both by their friends and enemies. They ſometimes ſtep in between two hoſtile armies, who are ſtanding with their ſwords drawn and their ſpears extended, ready to engage; and by their eloquence, as by an irreſiſtible enchantment, they prevent the effuſion of blood, and prevail upon them to ſheath their ſwords. So great are the charms of eloquence and the power of wiſdom, even among the moſt fierce barbarians." The Britiſh kings and chieftains, who were educated by the druids, were famous for their eloquence. This is evident from the many noble ſpeeches which are aſcribed to them by the Greek and Roman writers. For though theſe ſpeeches may not be genuine, yet they are a proof that it was a well-known fact that theſe princes were accuſtomed to make harangues on theſe and the like occaſions. This we are expreſsly told by Tacitus. "The Britiſh chieftains, before a battle, fly from rank to rank, and addreſs their men with animating ſpeeches, tending to inflame their courage, increaſe their hopes, and diſpel their fears." Theſe harangues were called, in the ancient language of Britain, *Broſnichiy Kah*, which is literally tranſlated by Tacitus *Incitamenta Belli*, "incentives to war." The genuine poſterity of the ancient Britons long retained their taſte for eloquence, and their high eſteem for thoſe who excelled in that art. "Orators (ſays Mr Martin) were in high eſteem, both in theſe iſlands (the Æbude) and the continent, until within theſe forty years. They ſat always among the nobles or chiefs of families in the ſtreah or circle. Their houſes and little villages were ſanctuaries, as well as churches, and they took place before doctors of phyſic. The orators, after the druids were extinct, were brought in to preſerve the genealogy of families, and to repeat the ſame at every ſucceſſion of a chief; and upon the occaſion of marriages and births, they made epithalamiums and panegyrics, which the poet or bard pronounced. The orators, by the force of their eloquence, had a powerful aſcendant over the greateſt men in their time. For if any orator did but aſk the habit, arms, horſe, or any other thing belonging to the greateſt man in theſe iſlands, it was readily granted him; ſometimes out of reſpect, and ſometimes for fear of being exclaimed againſt by a ſatyr, which in thoſe days was reckoned a great diſhonour."

13 Magic and divination. If the Britiſh druids, conſidering the times in which they lived, had made no contemptible proficiency in ſeveral parts of real and uſeful learning; it cannot be denied that they were alſo great pretenders to ſuperior knowledge in certain vain fallacious ſciences, by which they excited the admiration, and took advantage of the ignorance and credulity of mankind. Theſe were the ſciences (if they may be ſo called) of magic and divination; by which they pretended to work a kind of miracles, and exhibit aſtoniſhing appearances in nature; to penetrate into the counſels of heaven; to foretel future events, and to diſcover the ſucceſs or miſcarriage of public or private undertakings. Their own countrymen not only believed that the druids of Gaul and Britain were poſſeſſed of theſe powers, but they were celebrated on this account by the philoſophers of Greece and Rome. "In Britain (ſays Pliny) the magic arts are cultivated with ſuch aſtoniſhing ſucceſs, and ſo many ceremonies at this day, that the Britons ſeem to be capable of inſtructing even the Perſians themſelves in theſe arts. They pretend to diſcover the deſigns and purpoſes of the gods. The Eubates or Vates in particular inveſtigate and diſplay the moſt ſublime ſecrets of nature; and, by auſpices and ſacrifices, they foretel future events." They were ſo famous for the ſuppoſed veracity of their predictions, that they were not only conſulted on all important occaſions by their own princes and great men, but even ſometimes by the Roman emperors. Nor is it very difficult to account for all this. The druids finding that the reputation of their magical and prophetical powers contributed not a little to the advancement of their wealth and influence, they endeavoured, no doubt, to ſtrengthen and eſtabliſh it by all their art and cunning. Their knowledge of natural philoſophy and mechanics enabled them to execute ſuch works, and to exhibit ſuch appearances, or to make the world believe that they did exhibit them, as were ſufficient to gain them the character of great magicians. The truth is, that nothing is more eaſy than to acquire this character in a dark age, and among an unenlightened people. When the minds of men are haunted with dreams of charms and enchantments, they are apt to fancy that the moſt common occurrences

currences in nature are the effects of magical arts. The following ſtrange ſtory, which we meet with in Plutarch's Treatiſe of the Ceſſation of Oracles, was probably occaſioned by ſomething of this kind. "There are many iſlands which lie ſcattered about the iſle of Britain, after the manner of our Sporades. They are generally unpeopled, and ſome of them are called the *Iſlands of the Heroes*. One Demetrius was ſent by the emperor (perhaps Claudius) to diſcover thoſe parts. He arrived at one of theſe iſlands (ſuppoſed by ſome to be Angleſey, but more probably one of Æbudæ) next adjoining to the iſle of Britain before mentioned, which was inhabited by a few Britons, who were eſteemed ſacred and inviolable by their countrymen. Immediately after his arrival the air grew black and troubled, and ſtrange apparitions were ſeen; the winds roſe to a tempeſt, and fiery ſpouts and whirlwinds appeared dancing towards the earth." This was probably no more than a ſtorm of wind, accompanied with rain and lightning; a thing neither unnatural nor uncommon: but Demetrius and his companions having heard that the Britiſh druids, by whom this iſle was chiefly inhabited, were great magicians, they imagined that it was raiſed by them; and fancied that they ſaw many ſtrange unnatural ſights. The druids did not think proper to undeceive them; for when they enquired at them about the cauſe of this ſtorm, they told them it was occaſioned by the death of one of thoſe inviſible beings or genii who frequented their iſle. A wonderful and artful tale, very well calculated to encreaſe the ſuperſtitious terrors of Demetrius and his crew; and to determine them to abandon this enchanted iſle, with a reſolution never to return. Stonehenge, and ſeveral other works of the druids, were believed to have been executed by the arts of magic and enchantment, for many ages after the deſtruction of their whole order: nor is it improbable that they perſuaded the vulgar in their own times to entertain the ſame opinion of theſe works, by concealing from them the real arts by which they were performed. The natural and acquired ſagacity of the druids, their long experience, and great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterpriſes. Theſe conjectures they pronounced as oracles, when they were conſulted; and they pretended to derive them from the inſpection of the entrails of victims, the obſervation of the flight and feeding of certain birds, and many other mummeries. By theſe, and the like arts, they obtained and preſerved the reputation of prophetic foreſight among an ignorant and credulous people. But theſe pretenſions of the druids to magic and divination, which contributed ſo much to the advancement of their fame and fortune in their own times, have brought very heavy reproaches upon their memory, and have made ſome learned moderns declare that they ought to be expunged out of the catalogue of philoſophers, and eſteemed no better than mere cheats and jugglers. This cenſure is evidently too ſevere, and might have been pronounced with equal juſtice upon all the ancient philoſophers of Egypt, Aſſyria, Perſia, Greece, and Rome; who were great pretenders to magic and divination, as well as our druids. "I know of no nation in the world (ſays Cicero) either ſo polite and learned, or ſo ſavage and barbarous, as not to believe that future events are preſignified to us, and may by ſome men be diſcovered and foretold." The only concluſion therefore that can be fairly drawn, from the ſucceſsful pretenſions of the Britiſh druids to the arts of magic and divination, is this—That they had more knowledge than their countrymen and cotemporaries; but had not ſo much virtue to reſiſt the temptation of impoſing upon their ignorance, to their own advantage.

DRUM, is a martial muſical inſtrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is ſtretched or ſlackened at pleaſure by the means of ſmall cords or ſliding knots. It is beat upon with ſticks. Drums are ſometimes made of braſs, but moſt commonly they are of wood.—The drum is by Le Clerc ſaid to have been an oriental invention, and to have been brought by the Arabians, or perhaps rather the Moors, into Spain.

Kettle Drums, are two ſorts of large baſons of copper or braſs, rounded in the bottom, and covered with vellum or goat ſkin, which is kept faſt by a circle of iron round the body of the drum, with a number of ſcrews to ſcrew up and down. They are much uſed among the horſe; as alſo in operas, oratorios, concerts, &c.

Drum, or *Drummer*, he that beats the drum; of whom each company of foot has one, and ſometimes two. Every regiment has a drum-major, who has the command over the other drums. They are diſtinguiſhed from the ſoldiers by cloaths of a different faſhion: their poſt, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the diviſions.

Drum of the Ear, the ſame with the *tympanum*. See Anatomy, nº 141.

DRUMMOND (William), a polite writer, born in Scotland in 1585, was the ſon of Sir John Drummond, who for ten or twelve years was uſher and afterwards knight of the black rod to James VI. His family became firſt diſtinguiſhed by the marriage of Robert III. whoſe queen was ſiſter to William Drummond of Carnock their anceſtor; as appears by the patents of that king and James I. the one calling him "our brother," the other "our uncle."

Drummond was educated at Edinburgh, where he took the degree of A. M. In 1606 he was ſent by his father to ſtudy civil law at Bourges in France: but having no taſte for the profeſſion of a lawyer, he returned to Scotland, and retired to his agreeable ſeat at Hawthornden; where he applied himſelf with great aſſiduity to claſſical learning and poetry, and obliged the world with ſeveral fine productions. Here he wrote his Cypreſs Grove, a piece of excellent proſe, after a dangerous fit of ſickneſs; and about the ſame time, his Flowers of Sion, in verſe. But an accident befel him, which obliged him to quit his retirement; and that was the death of an amiable lady to whom he was juſt going to be married. This affected him ſo deeply, that he went to Paris and Rome, between which two places he reſided eight years. He travelled alſo thro' Germany, France, and Italy: where he viſited univerſities; converſed with learned men; and made a choice collection of the ancient Greek, and of the modern Spaniſh, French, and Italian books. He then returned to his native country; and ſome time thereafter married Margaret Logan, a grand-daughter of Sir Robert Logan. Upon the appearance of a civil war, he retired again; and in this retirement is ſuppoſed to have written his hiſtory of the Five James's, ſucceſſively kings of Scotland, which was not publiſhed till after his death. Having been grafted as it were on the royal family of Scotland, and upheld by them, he was ſteadily attached to Charles I.; but does not appear ever to have armed for him. As he had always been a laborious ſtudent, and had applied himſelf equally to hiſtory and politics as to claſſical learning, his ſervices were better rendered by occaſional publications, in which he ſeveral times diſtinguiſhed himſelf. In a piece called *Irene*, he harangues the king, nobility, and clergy, about their mutual miſtakes, fears, and jealouſies; and lays before them the conſequences of a civil war, from indiſputable arguments and the hiſtories of paſt times. The great Marquis of Montroſe wrote a letter to him, deſiring him to print this Irene, as the beſt means to quiet the minds of a diſtracted people: he likewiſe ſent him a protection dated Auguſt 1645, immediately after the battle of Kilſyth, with a letter, in which he commends Mr Drummond's learning and loyalty. Mr Drummond wrote other things alſo with the ſame view of promoting peace and union, of calming the diſturbed minds of the people, of reaſoning the better ſort into moderation, and checking the growing evils which would be the conſequence of their obſtinacy. But his efforts were fruitleſs; and his attachment to the king and his cauſe were ſo ſtrong, that when he heard of the ſentence being executed on him, he was overwhelmed with grief, and lifted his head no more. He died in the year 1649, leaving behind him ſeveral children: the eldeſt of whom, William, was knighted by Charles II. He had a great intimacy and correſpondence with the two famous Engliſh poets, Michael Drayton and Ben Johnſon; the latter of whom, at the age of 45, travelled from London on foot, to viſit him at Hawthornden. An edition of his works, with his life prefixed, was printed in folio at Edinburgh, 1711.

Among all the writers, at the beginning of the laſt century, who flouriſhed after the death of Shakeſpeare, an ingenious critic † obſerves, there is not one whom a general reader of the Engliſh poetry of that age will regard with ſo much and ſo deſerved attention as William Drummond. In a ſurvey of his poetry, two conſiderations muſt be had, *viz.* the nation of which he was, and the time when he wrote. Yet will theſe be found not offered to extenuate faults, but to increaſe admiration. His thoughts are often, nay generally, bold and highly poetical: he follows nature, and his verſes are delicately harmonious. As his poems are not eaſily met with, and have perhaps by many readers never been heard of, a few extracts may be excuſed.

On the death of Henry prince of Wales in 1612, Drummond wrote an elegy intitled Tears on the Death of Moeliades; a name which that prince had uſed in all his challenges of martial ſport, as the anagram of *Miles a Deo*. In this poem are lines, according to Denham's terms, as ſtrong, as deep, as gentle, and as full, as any of his or Waller's. The poet laments the fate of the prince, that he died not in ſome glorious cauſe of war: "againſt the Turk (he ſays) thou hadſt ended thy life and the Chriſtian war together;"

Or, as brave Bourbon, thou hadſt made old Rome,
Queen of the world, thy triumph and thy tombe.

Of the lamentation of the river Forth:

And as ſhe ruſh'd her Cyclades among,
She ſeem'd to plain that Heaven had done her wrong.

Further:

Tagus did court his love with golden ſtreams,
Rhine with her towns, fair Seine with all ſhe claims:
But ah, poor lovers! death did them betray;
And, unſuſpected, made their hopes his prey.

And concludes:

The virgins to thy tomb will garlands bear
Of flow'rs, and with each flow'r let fall a tear.
Moeliades ſweet courtly nymphs deplore,
From Thule to Hydaſpes' pearly ſhore.

Perhaps there are no lines of Pope of which the eaſy flow may be more juſtly admired than of thoſe in his third paſtoral:

Not bubbling fountains to the thirſty ſwain,
Not balmy ſleep to lab'rers faint with pain,
Not ſhow'rs to larks, or ſun-ſhine to the bee,
Are half ſo charming as thy ſight to me.

When King James I. after his acceſſion to the Engliſh throne, returned to Scotland in 1617, his arrival was celebrated by every effort of poetical congratulation. Upon this occaſion Drummond compoſed a panegyric intitled The Wandering Muſes, or the River Forth feaſting; in which are found four lines apparently imitated by Pope in the above paſſage, and which do not in point of harmony fall much ſhort of that imitation. He ſays,

To virgins, flow'rs; to ſun-burnt earth, the rain;
To mariners, fair winds amidſt the main;
Cool ſhades, to pilgrims whom hot glances burn;
Are not ſo pleaſing as thy bleſt return.

Of theſe two poems of Drummond, it is obſervable, that the firſt was written in 1612, the laſt in 1617. The earlieſt piece of Waller is that to the king on his navy in 1625. The piece in which Sir John Denham's greateſt force lies, Cooper's Hill, was not written till 1640. The harmony of Drummond, therefore, at a time when thoſe who are uſually called the firſt introducers of a ſmooth and poliſhed verſification had not yet begun to write, is an honour to him that ſhould never be forgotten. Nor is his excellence half enough praiſed or acknowledged.

Drummond and Petrarch had this in common, that each lamented, firſt the cruelty, and then the loſs of his miſtreſs; ſo that their ſonnets are alike naturally divided into two parts, thoſe before and thoſe after their ſeveral miſtreſſes deaths. It may juſtly be doubted, that among all the ſonneteers in the Engliſh language any one is to be preferred to Drummond. He has ſhown in ſome of theſe compoſitions nearly the ſpirit of Petrarch himſelf. Of each period one is here inſerted; the firſt, before the death of his miſtreſs:

Ah me, and am I now the man, whoſe muſe
  In happier times was wont to laugh at love,
  In thoſe who ſuffered that blind boy abuſe
  The noble gifts were giv'n them from above!

What metamorphoſe ſtrange is this I prove?
  Myſelf I ſcarce now find myſelf to be;
  And think no fable Circe's tyrannie,
  And all the tales are told of changed Jove.

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† *Curſory Remarks on ſome of the Engliſh Poets*, 8vo. 1789.

Virtue hath taught, with her philoſophy,
My mind unto a better courſe to move;
Reaſon may chide her full, and oft reprove
Affection's pow'r; but what is that to me,
Who ever think, and never think on aught
But that bright cherubim which thralls my thought!

From Part II. after her death, (Sonnet I.)

Of mortal glory, O ſoon dark'ned ray!
O winged joys of man, more ſwift than wind!
O fond deſires which in our fancies ſtray!
O traiterous hopes which do our judgments blind!
Lo, in a flaſh that light is gone away,
Which dazzle did each eye, delight each mind;
And with that ſun from whence it came combin'd,
Now makes more radiant heav'n's eternal day.
Let Beauty now bedew her cheeks with tears;
Let widow'd Muſic only roar and groan;
Poor Virtue, get thee wings and mount the ſpheres,
For dwelling-place on earth for thee is none:
Death hath thy temple raz'd, Love's empire foil'd,
The world of honour, worth, and ſweetneſs ſpoil'd.

The ſeventh ſonnet of the firſt part has much reſemblance to Sir Henry Wotton's elegant little poem on the Queen of Bohemia, "Ye meaner beauties," &c. Among Drummond's Flowers of Sion, the poem which begins "Amidſt the azure clear—of Jordan's ſacred ſtreams," eminently diſtinguiſhes him, whether he be conſidered as a philoſopher or a poet.

DRUNKENNESS, a well known diſorder in the brain, occaſioned by drinking too freely of ſpirituous liquors. Drunkenneſs appears in different ſhapes in different conſtitutions: ſome it makes gay, ſome ſullen, and ſome furious. The miſchief of drunkenneſs conſiſts in the following bad effects: 1. It betrays moſt conſtitutions either into extravagancies of anger, or ſins of lewdneſs. 2. It diſqualifies men for the duties of their ſtation, both by the temporary diſorder of their faculties, and at length by a conſtant incapacity and ſtupefaction. 3. It is attended with expences, which can often be ill ſpared. 4. It is ſure to occaſion uneaſineſs to the family of the drunkard. 5. It ſhortens life. To theſe conſequences of drunkenneſs muſt be added the peculiar danger and miſchief of the example. "Drunkenneſs (Mr Paley obſerves) is a ſocial feſtive vice. The drinker collects his circle; the circle naturally ſpreads; of thoſe who are drawn within it, many become the corrupters and centres of ſets and circles of their own; every one countenancing, and perhaps emulating the reſt, till a whole neighbourhood be infected from the contagion of a ſingle example. With this obſervation upon the ſpreading quality of drunkenneſs, may be connected a remark which belongs to the ſeveral evil effects above recited. The conſequences of a vice, like the ſymptoms of a diſeaſe, though they be all enumerated in the deſcription, ſeldom all meet in the ſame ſubject. In the inſtance under conſideration, the age and temperature of one drunkard may have little to fear from inflammations of luſt or anger; the fortune of a ſecond may not be injured by the expence; a third may have no family to be diſquieted by his irregularities; and a fourth may poſſeſs a conſtitution fortified againſt the poiſon of ſtrong liquors. But if, as we always ought to do, we comprehend within the conſequences of our conduct the miſchief and tendency of the example, the above circumſtances, however fortunate for the individual, will be found to vary the guilt of his intemperance leſs, probably, than he ſuppoſes. Although the waſte of time and money may be of ſmall importance to you, it may be of the utmoſt to ſome one or other whom your ſociety corrupts. Repeated, or long continued exceſſes, which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your abſence from home, or expect your return to it with terror; other families, whoſe huſbands and fathers have been invited to ſhare in your ebriety, or encouraged to imitate it, may juſtly lay their miſery or ruin at your door. This will hold good, whether the perſon ſeduced be ſeduced immediately by you, or the vice be propagated from you to him, through ſeveral intermediate examples."

The ancient Lacedemonians uſed to make their ſlaves frequently drunk, to give their children an averſion and horror for the ſame. The Indians hold drunkenneſs a ſpecies of madneſs; and in their language, the ſame term *(ramgam)*, that ſignifies "drunkard," ſignifies alſo a "phrenetick."

Drunkenneſs is repeatedly forbidden by St Paul: "Be not drunk with wine, wherein is exceſs." "Let us walk honeſtly as in the day, not in rioting and drunkenneſs." "Be not deceived: neither fornicators, nor drunkards, nor revilers, nor extortioners, ſhall inherit the kingdom of God." Eph. v. 18. Rom. xiii. 13. 1. Cor. vi. 9, 10. The ſame apoſtle likewiſe condemns drunkenneſs, as peculiarly inconſiſtent with the Chriſtian profeſſion: "They that be drunken, are drunken in the night; but let us, who are of the day, be ſober." 1. Theſſ. v. 7, 8.

Drunkenneſs, by our laws, is looked upon as an aggravation rather than an excuſe for any criminal behaviour. A drunkard, ſays Sir Edward Coke, who is *voluntarius dæmon*, hath no privilege thereby; but what hurt or ill ſoever he doth, his drunkenneſs doth aggravate it: *nam omne crimen ebrietas, et incendit, et detergit.* It hath been obſerved that the real uſe of ſtrong liquors, and the abuſe of them by drinking to exceſs, depend much upon the temperature of the climate in which we live. The ſame indulgence which may be neceſſary to make the blood move in Norway, would make an Italian mad. A German therefore, ſays the preſident Monteſquieu, drinks through cuſtom founded upon conſtitutional neceſſity; a Spaniard drinks through choice, or out of the mere wantonneſs of luxury; and drunkenneſs, he adds, ought to be more ſeverely puniſhed where it makes men miſchievous and mad, as in Spain and Italy, than where it only renders them ſtupid and heavy, as in Germany and more northern countries. And accordingly, in the warmer climate of Greece, a law of Pittacus enacted, "that he who committed a crime when drunk, ſhould receive a double puniſhment;" one for the crime itſelf, and the other for the ebriety which prompted him to commit it. The Roman law indeed made great allowances for this vice: *per vinum delapſis capitalis pœna remittitur*. But the law of England, conſidering how eaſy it is to counterfeit this excuſe, and how weak an excuſe it is (though real), will not ſuffer any man thus to privilege one crime by another.

For the offence of drunkenneſs a man may be puniſhed in the eccleſiaſtical court, as well as by juſtices of peace by ſtatute. And by 4 *Jac.* I. *c.* 5. and 21 *Jac.* I. *c.* 7. if any perſon ſhall be convicted of drunkenneſs by the view of a juſtice, oath of one witneſs, &c. he ſhall forfeit 5s. for the firſt offence, to be levied by diſtreſs and ſale of his goods; and for want of a diſtreſs, ſhall ſit in the ſtocks ſix hours: and, for the ſecond offence, he is to be bound with two ſureties in 10l. each, to be of good behaviour, or to be committed. And he who is guilty of any crime thro' his own voluntary drunkenneſs, ſhall be puniſhed for it as if he had been ſober. It has been held that drunkenneſs is a ſufficient cauſe to remove a magiſtrate: and the proſecution for this offence by the ſtatute of 4 *Jac.* I. *c.* 5. was to be, and ſtill may be, before juſtices of peace in their ſeſſions by way of indictment, &c. Equity will not relieve againſt a bond, &c. given by a man when drunk, unleſs the drunkenneſs is occaſioned through the management or contrivance of him to whom the bond is given.

The appetite for intoxicating liquors appears to be almoſt always acquired. One proof of which is, that it is apt to return only at particular times and places; as after dinner, in the evening, on the market day, at the market town, in ſuch a company, at ſuch a tavern. And this may be the reaſon, that if a habit of drunkenneſs be ever overcome, it is upon ſome change of place, ſituation, company, or profeſſion. A man ſunk deep in a habit of drunkenneſs, will upon ſuch occaſions as theſe, when he finds himſelf looſened from the aſſociations which held him faſt, ſometimes make a plunge, and get out. In a matter of ſuch great importance, it is well worth while, where it is tolerably convenient, to change our habitation and ſociety, for the ſake of the experiment.

Habits of drunkenneſs commonly take their riſe either from a fondneſs for and connection with ſome company, or ſome companion, already addicted to this practice; which affords an almoſt irreſiſtible invitation to take a ſhare in the indulgencies which thoſe about us are enjoying with ſo much apparent reliſh and delight; or from want of regular employment, which is ſure to let in many ſuperfluous cravings and cuſtoms, and often this amongſt the reſt; or, laſtly, from grief or fatigue, both which ſtrongly ſolicit that relief which inebriating liquors adminiſter for the preſent, and furniſh a ſpecious excuſe for complying with the inclination. But the habit, when once ſet in, is continued by different motives from thoſe to which it owes its origin. Perſons addicted to exceſſive drinking ſuffer, in the intervals of ſobriety, and near the return of their accuſtomed indulgence, a faintneſs and oppreſſion about the *praecordia* which it exceeds the ordinary patience of human nature to endure. This is uſually relieved for a ſhort time by a repetition of the ſame exceſs: and to this relief, as to the removal of every long continued pain, they who have once experienced it are urged almoſt beyond the power of reſiſtance. This is not all: as the liquor loſes its ſtimulus, the doſe muſt be increaſed, to reach the ſame pitch of elevation or eaſe; which increaſe proportionably accelerates the progreſs of all the maladies that drunkenneſs brings on. Whoever reflects, therefore, upon the violence of the craving in advanced ſtages of the habit, and the fatal termination to which the gratification of it leads, will, the moment he perceives the leaſt tendency in himſelf of a growing inclination to intemperance, collect his reſolution to this point; or (what perhaps he will find his beſt ſecurity) arm himſelf with ſome peremptory rule, as to the times and quantity of his indulgencies.

DRUPA, or Druppa, in botany, a ſpecies of *pericarpium* or ſeed-veſſel, which is ſucculent or pulpy, has no valve or external opening like the capſule and pod, and contains within its ſubſtance a ſtone or nut. The cherry, plum, peach, apricot, and all other ſtone-fruit are of this kind.

The term, which is of great antiquity, is ſynonimous to Tournefort's *fructus mollis oſſiculo*, "ſoft fruit with a ſtone;" and to the *prunus* of other botaniſts.

The ſtone or nut, which in this ſpecies of fruit is ſurrounded by the ſoft pulpy fleſh, is a kind of ligneous or woody cup, which contains a ſingle kernel or ſeed.

This definition, however, will not apply to every ſeed-veſſel denominated *drupa* in the *Genera Plantarum*. The almond is a *drupa*, ſo is the ſeed-veſſel of the elm-tree and the genus *rumphia*, though far from being pulpy or ſucculent; the firſt and third are of a ſubſtance like leather, the ſecond like parchment. The ſame may be ſaid of the walnut, piſtachia-nut, *guettarda*, *quiſqualis*, jack-in-a-box, and ſome others.

Again, the ſeeds of the elm, *ſchrebera*, *flagellaria*, and the mango-tree, are not contained in a ſtone. The ſeed-veſſel of burr-reed is dry, ſhaped like a top, and contains two angular ſtones.

This ſpecies of fruit, or more properly ſeed-veſſel, is commonly roundiſh, and when ſeated below the calyx or receptacle of the flower, is furniſhed, like the apple, at the end oppoſite to the foot-ſtalk, with a ſmall umbilicus or cavity, which is produced by the ſwelling of the fruit before the falling off of the flower-cup.

DRUSES, or Druzes, a remarkable nation in Paleſtine, inhabiting the environs of Mount Lebanon, of whoſe origin and hiſtory we have the following detail by M. Volney.

Twenty-three years after the death of Mahomet, the diſputes between Ali his ſon-in-law and Moaouia governor of Syria, occaſioned the firſt ſchiſm in the empire of the Arabs, and the two ſects ſubſiſt to this day: but, in reality, this difference related only to power; and the Mahometans, however divided in opinion reſpecting the rightful ſucceſſor of the prophet, were agreed with reſpect to their dogmas. It was not until the following century that the peruſal of Greek books introduced among the Arabs a ſpirit of diſcuſſion and controverſy, to which till then they were utter ſtrangers. The conſequence was, as might be expected, by reaſoning on matters not ſuſceptible of demonſtration, and guided by the abſtract principles of an unintelligible logic, they divided into a multitude of ſects and opinions. At this period, too, the civil power loſt its authority; and religion, which from that derives the means of preſerving its unity, ſhared the ſame fate, and the Mahometans now experienced what had before befallen the Chriſtians. The nations which had received the religion of Mahomet, mixed with it their former abſurd notions; and the errors which had anciently prevailed over Aſia again made their appearance, though altered in their forms. The metempſychoſis, the doctrine of a good and evil principle, and the renovation after ſix thouſand years, as it had been taught by Zoroaſter, were again revived among the

Mahometans. In this political and religious confuſion, every enthuſiaſt became an apoſtle, and every apoſtle the head of a ſect. No leſs than ſixty of theſe were reckoned, remarkable for the numbers of their followers, all differing in ſome points of faith, and all diſavowing hereſy and error. Such was the ſtate of theſe countries when at the commencement of the 11th century Egypt became the theatre of one of the moſt extravagant ſcenes of enthuſiaſm and abſurdity ever recorded in hiſtory. The following account is extracted from the eaſtern writers.

In the year of the Hejira 386 (A. D. 996), the third caliph of the race of the Fatmites, called *Hakem-b'amr-ellah*, ſucceeded to the throne of Egypt at the age of 11 years. He was one of the moſt extraordinary princes of whom hiſtory has preſerved the memory. He cauſed the firſt caliphs, the companions of Mahomet, to be curſed in the moſques, and afterwards revoked the anathema: He compelled the Jews and Chriſtians to abjure their religion, and then permitted them to reſume it. He prohibited the making ſlippers for women, to prevent them from coming out of their houſes. He burnt one half of the city of Cairo for his diverſion, while his ſoldiers pillaged the other. Not contented with theſe extravagant actions, he forbade the pilgrimage to Mecca, faſting, and the five prayers; and at length carried his madneſs ſo far as to deſire to paſs for God himſelf. He ordered a regiſter of thoſe who acknowledged him to be ſo, and the number amounted to ſixteen thouſand. This impious pretenſion was ſupported by a falſe prophet, who came from Perſia into Egypt; which impoſtor, named *Mohammad-ben-Iſmael*, taught that it was not neceſſary to faſt or pray, to practiſe circumciſion, to make the pilgrimage to Mecca, or obſerve feſtivals; that the prohibition of pork and wine was abſurd; and that marriage between brothers and ſiſters, fathers and children, was lawful. To ingratiate himſelf with Hakem, he maintained that this caliph was God himſelf incarnate; and inſtead of his name *Hakem-b'amr-ellah*, which ſignifies *governing by the order of God*, he called him *Hakem-b'amr-eh*, *governing by his own order*. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who ſlew him in a tumult almoſt in the arms of the caliph, who was himſelf maſſacred ſoon after on mount Mokattam, where he, as he ſaid, had held converſation with angels.

The death of theſe two chiefs did not ſtop the progreſs of their opinions: a diſciple of Mohammad-ben-Iſmael, named *Hamza-ben-Ahmud*, propagated them with an indefatigable zeal in Egypt, in Paleſtine, and along the coaſt of Syria, as far as Sidon and Bergtus. His proſelytes being perſecuted by the ſect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themſelves; at leaſt it is certain, that, ſhortly after this era, we find them eſtabliſhed there, and forming an independent ſociety.

The difference of their opinions diſpoſes them to be enemies; but the urgent intereſt of their common ſafety forces them to allow mutual toleration, and they have always appeared united, and have jointly oppoſed, at different times, the Cruſaders, the ſultans of Aleppo, the Mamlouks, and the Ottomans. The conqueſt of Syria by the latter, made no change in their ſituation. Selim I. on his return from Egypt, meditating no leſs than the conqueſt of Europe, diſdained to waſte his time before the rocks of Lebanon. Soliman II. his ſucceſſor, inceſſantly engaged in important wars, either with the knights of Rhodes, the Perſians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently deſcended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulſed. And it was not till the year 1588 that Amurath III. wearied with the complaints made to him, reſolved, at all events, to reduce theſe rebels, and had the good fortune to ſucceed. His general Ibrahim Pacha marched from Cairo, and attacked the Druzes and Maronites with ſo much addreſs and vigour as to force them into their ſtrong holds, the mountains. Diſſenſion took place among their chiefs, of which he availed himſelf to exact a contribution of upwards of one million of piaſters, and to impoſe a tribute which has continued to the preſent time.

It appears that this expedition was the epocha of a conſiderable change in the conſtitution of the Druzes. Till then they had lived in a ſort of anarchy, under the command of different ſhaiks or lords. The nation was likewiſe divided into two factions, ſuch as is to be found in all the Arab tribes, and which are diſtinguiſhed into the party Kaiſi and the party Yamani. To ſimplify the adminiſtration, Ibrahim permitted them only one chief who ſhould be reſponſible for the tribute, and execute the office of civil magiſtrate; and this governor, from the nature of his ſituation, acquiring great authority, became almoſt the king of the republic; but as he was always choſen from among the Druzes, a conſequence followed which the Turks had not foreſeen, and which was nearly fatal to their power. For the chief thus choſen, having at his diſpoſal the whole ſtrength of the nation, was able to give it unanimity and energy, and it naturally turned againſt the Turks; ſince the Druzes, by becoming their ſubjects, had not ceaſed to be their enemies. They took care, however, that their attacks ſhould be indirect, ſo as to ſave appearances, and only engaged in ſecret hoſtilities, more dangerous, perhaps, than open war.

About this time, that is, the beginning of the 17th century, the power of the Druzes attained its greateſt height; which it owed to the talents and ambition of the celebrated Faker-el-din, commonly called *Fakardin*. No ſooner was this prince advanced to be the chief of that people than he turned his whole attention to humble the Ottoman power, and aggrandize himſelf at its expence. In this enterprize he diſplayed an addreſs ſeldom ſeen among the Turks. He firſt gained the confidence of the Porte, by every demonſtration of loyalty and fidelity; and as the Arabs at that time infeſted the plain of Balbek and the countries of Sour and Acre, he made war upon them, freed the inhabitants from their depredations, and thus rendered them deſirous of living under his government.

The city of Bairout was ſituated advantageouſly for his deſigns, as it opened a communication with foreign countries, and, among others, with the Venetians, the natural enemies of the Turks. Faker-el-din availed himſelf of the miſconduct of the Aga, expelled him, ſeized on the city, and even had the art to make a merit of this act of hoſtility with the Divan, by paying a more conſiderable tribute. He proceeded in the ſame manner at Saide Balbek and Sour; and at length, about the year 1613, ſaw himſelf maſter of all the country as far as Adjaloun and Safad. The pachas of Tripoli and Damaſcus could not ſee theſe encroachments with indifference; ſometimes they oppoſed him with open force, though ineffectually, and ſometimes endeavoured to ruin him at the Porte by ſecret inſinuations; but the Emir, who maintained there his ſpies and defenders, defeated every attempt.

At length, however, the Divan began to be alarmed at the progreſs of the Druzes, and made preparations for an expedition capable of cruſhing them. Whether from policy or fear, Faker-el-din did not think proper to wait this ſtorm. He had formed connections in Italy, on which he built great hopes, and determined to go in perſon to ſolicit the ſuccours they had promiſed him; perſuaded that his preſence would encreaſe the zeal of his friends, while his abſence might appeaſe the reſentment of his enemies. He therefore embarked at Bairout; and after reſigning the adminiſtration to his ſon Ali, repaired to the court of the Medici at Florence. The arrival of an Oriental prince in Italy did not fail to attract the public attention. Enquiry was made into his nation, and the origin of the Druzes became popular topics of reſearch. Their hiſtory and religion were found to be ſo little known as to leave it a matter of doubt whether they ſhould be claſſed with the Mahometans or Chriſtians. The Cruſades were called to mind; and it was ſoon ſuggeſted, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offspring of the Cruſaders.

This idle conceit was too favourable to Faker-el-din for him to endeavour to diſprove it: he was artful enough, on the contrary, to pretend he was related to the houſe of Lorraine; and the miſſionaries and merchants, who promiſed themſelves a new opening for converſion and commerce, encouraged his pretenſions. When an opinion is in vogue, every one diſcovers new proofs of its certainty. The learned in etymology, ſtruck with the reſemblance of the names, inſiſted, that Druzes and Dreux muſt be the ſame word; and on this foundation formed the ſyſtem of a pretended colony of French Cruſaders, who, under the conduct of a Comte de Dreux, had formed a ſettlement in Lebanon. This hypotheſis, however, was completely overthrown by the remark, that the name of the Druzes is to be found in the itinerary of Benjamin of Tudela, who travelled before the time of the Cruſades. Indeed the futility of it ought to have been ſufficiently apparent at firſt, from the ſingle conſideration, that had they been deſcended from any nation of the Franks, they muſt have retained at leaſt the traces of ſome European language; for a people, retired into a ſeparate diſtrict, and living diſtinct from the natives of the country, do not loſe their language. That of the Druzes, however, is very pure Arabic, without a ſingle word of European origin. The real derivation of the name of this people has been long in our poſſeſſion without our knowing it. It originates from the founder of the ſect of Mohammad-ben-Iſmael, who was ſurnamed *El-Dorzi*, and not *El-Darari*, as it is uſually printed: the confuſion of theſe two words, ſo different in our writing, ariſes from the figure of the two Arabic letters *r* and *z*, which have only this difference, that the *z* has a point over it, frequently omitted or effaced in the manuſcripts.

After a ſtay of nine years in Italy, Faker-el-din returned to reſume the government of his country. During his abſence, his ſon Ali had repulſed the Turks, appeaſed diſcontents, and maintained affairs in tolerable good order. Nothing remained for the Emir, but to employ the knowledge he could not but have acquired, in perfecting the internal adminiſtration of government, and promoting the welfare of the nation; but inſtead of the uſeful and valuable arts, he wholly abandoned himſelf to the frivolous and expenſive, for which he had imbibed a paſſion while in Italy. He built numerous villas; conſtructed baths, and planted gardens; he even preſumed, without reſpect to the prejudices of his country, to employ the ornaments of painting and ſculpture, notwithſtanding theſe are prohibited by the Koran.

The conſequences of this conduct ſoon manifeſted themſelves: the Druzes, who paid the ſame tribute as in time of war, became diſſatisfied The Yamani faction were rouſed; the people murmured at the expences of the prince; and the luxury he diſplayed renewed the jealouſy of the pachas. They attempted to levy greater tribute: hoſtilities again commenced, and Faker-el-din repulſed the forces of the pachas; who took occaſion, from this reſiſtance, to render him ſuſpected by the ſultan himſelf. Amurath III. incenſed that one of his ſubjects ſhould dare to enter into a competition with him, reſolved on his deſtruction; and the pacha of Damaſcus received orders to march, with all his forces, againſt Bairout, the uſual reſidence of Faker-el-din; while 40 galleys inveſted it by ſea, and cut off all communication.

The Emir, who depended on his good fortune and ſuccours from Italy, determined at firſt to brave the ſtorm. His ſon Ali, who commanded at Safad, was ordered to oppoſe the progreſs of the Turkiſh army; and in fact he bravely reſiſted them, notwithſtanding the great diſparity of his forces: but after two engagements, in which he had the advantage, being ſlain in a third attack, the face of affairs were greatly changed, and every thing went to ruin. Faker-el-din, terrified at the loſs of his troops, afflicted at the death of his ſon, and enfeebled by age and a voluptuous life, loſt both courage and preſence of mind. He no longer ſaw any reſource but in a peace, which he ſent his ſecond ſon to ſolicit of the Turkiſh admiral, whom he attempted to ſeduce by preſents; but the admiral, detaining both the preſents and envoy, declared he would have the prince himſelf. Faker-el-din, intimidated, took to flight, and was purſued by the Turks, now maſters of the country. He took refuge on the ſteep eminence of Niha, where they beſieged him ineffectually for a whole year, when they left him at liberty: but ſhortly after, the companions of his adverſity, wearied with their ſufferings, betrayed and delivered him up to the Turks. Faker-el-din, though in the hands of his enemies, conceived hopes of pardon, and ſuffered himſelf to be carried to Conſtantinople; where Amurath, pleaſed to behold at his feet a prince ſo celebrated, at firſt treated him with that benevolence which ariſes from the pride of ſuperiority; but ſoon returning to his former jealouſies, yielded to the inſtigations of his courtiers, and, in one of his violent fits of paſſion, ordered him to be ſtrangled, about the year 1631.

After the death of Faker-el-din, the poſterity of that prince ſtill continued in poſſeſſion of the government, though at the pleaſure, and as vaſſals, of the Turks. This family failing in the male line at the beginning of the preſent century, the authority devolved, by the election of the ſhaiks, on the houſe of Shelah, in which it ſtill continues. The only emir of that houſe, whoſe name deſerves to be preſerved, is the emir Melhem, who reigned from 1740 to 1759; in which interval he retrieved the loſſes of the Druzes, and reſtored them to that conſequence which they had loſt by the defeat of Faker-el-din. Towards the end of his life, about the year 1754, Melhem, wearied with the cares of government, abdicated his authority, to live in religious retirement, after the manner of the Okkals; but the troubles that ſucceeded occaſioned him once more to reſume the reins of government, which he held till 1759, when he died, univerſally regretted.

He left three ſons, minors: the eldeſt of whom ought, according to the cuſtom of the country, to have ſucceeded him; but being only 11 years of age, the authority devolved on his uncle Manſour, agreeable to a law very general in Aſia, which wills the people to be governed by a ſovereign who has arrived at years of maturity. The young prince was but little fitted to maintain his pretenſions; but a Maronite, named Sad-el-Kouri, to whom Melhem had entruſted his education, took this upon himſelf. Aſpiring to ſee his pupil a powerful prince, that he might himſelf become a powerful viſir, he made every exertion to advance his fortune. He firſt retired with him to Djebail, in the Keſraouan, where the emir Youſef poſſeſſed large domains, and there undertook to conciliate the Maronites, by embracing every opportunity to ſerve both individuals and the nation. The great revenues of his pupil, and the moderation of his expenditure, amply furniſhed him with the means. The farm of the Keſraouan was divided between ſeveral ſhaiks, with whom the Porte was not very well ſatiſfied. Sad treated for the whole with the pacha of Tripoli, and got himſelf appointed ſole receiver. The Motoualis of the valley of Balbek had for ſome years before made ſeveral encroachments on Lebanon, and the Maronites began to be alarmed at the near approach of theſe intolerant Mahometans. Sad purchaſed of the pacha of Damaſcus a permiſſion to make war upon them; and in 1763 drove them out of the country. The Druzes were at that time divided into two factions: Sad united his intereſt with thoſe who oppoſed Manſour, and ſecretly prepared the plot which was to raiſe the nephew on the ruin of the uncle.

At this period the Arab Daher, who had made himſelf maſter of Galilee, and fixed his reſidence at Acre, diſquieted the Porte by his progreſs and pretenſions: to oppoſe him, the Divan had juſt united the pachalics of Damaſcus, Saide, and Tripoli, in the hands of Oſman and his children; and it was evident, that an open war was not very remote. Manſour, who dreaded the Turks too much to reſiſt them, made uſe of the policy uſual on ſuch occaſions, pretending a zeal for their ſervice, while he ſecretly favoured their enemy. This was a ſufficient motive for Sad to purſue meaſures directly oppoſite. He ſupported the Turks againſt the faction of Manſour, and manœuvered with ſo much good fortune or addreſs as to depoſe that emir in 1770, and place Youſef in his government.

In the following year Ali Bey declared war and attacked Damaſcus. Youſef, called on by the Turks, took part in the quarrel, but without being able to draw the Druzes from their mountains to enter into the army of the Ottomans. Beſides their natural repugnance, at all times, to make war out of their country, they were on this occaſion too much divided at home to quit their habitations, and they had reaſon to congratulate themſelves on the event. The battle of Damaſcus enſued; and the Turks, as we have already ſeen, were completely routed. The pacha of Saide eſcaping from this defeat, and not thinking himſelf in ſafety in that town, ſought an aſylum even in the houſe of the emir Youſef. The moment was unfavourable; but the face of affairs ſoon changed by the flight of Mohammad Bey. The emir, concluding that Ali Bey was dead, and not imagining that Daher was powerful enough ſingly to maintain the quarrel, declared openly againſt him. Saide was threatened with a ſiege, and he detached 1500 men of his faction to its defence; while himſelf in perſon, prevailing on the Druzes and Maronites to follow him, made an incurſion with 25,000 peaſants into the valley of Bekaa; and in the abſence of the Motoualis, who had joined the army of Daher, laid the whole country waſte with fire and ſword from Balbek to Tyre.

While the Druzes, proud of this exploit, were marching in diſorder towards the latter city, 500 Motoualis, informed of what had happened, flew from Acre inflamed with rage and deſpair, and fell with ſuch impetuoſity on their army as to give them a complete overthrow. Such was the ſurpriſe and confuſion of the Druzes, that, imagining themſelves attacked by Daher himſelf and betrayed by their companions, they turned their ſwords on each other as they fled. The ſteep declivities of Djezin, and the pine-woods which were in the route of the fugitives, were ſtrewed with dead, but few of whom periſhed by the hands of the Motoualis.

The emir Youſef, aſhamed of this defeat, eſcaped to Dair-el-Kamar, and ſhortly after attempted to take revenge; but being again defeated in the plain between Saide and Sour (Tyre), he was conſtrained to reſign to his uncle Manſour the ring, which among the Druzes is the ſymbol of command. In 1773 he was reſtored by a new revolution; but he could not ſupport his power but at the expence of a civil war. In order, therefore, to prevent Bairout falling into the hands of the adverſe faction, he requeſted the aſſiſtance of the Turks, and demanded of the pacha of Damaſcus a man of ſufficient abilities to defend that city. The choice fell on an adventurer; who, from his ſubſequent fortune, merits to be made known.

This man, named Ahmad, is a native of Boſnia, and ſpeaks the Sclavonian as his mother tongue, as the Raguſan captains, with whom he converſes in preference to thoſe of every other nation, aſſert. It is ſaid, that flying from his country at the age of 16, to eſcape the conſequences of an attempt to violate his ſiſter-in-law, he repaired to Conſtantinople, where, deſtitute of the means of procuring a ſubſiſtence, he ſold himſelf to the ſlave-merchants to be conveyed to Egypt; and, on his arrival at Cairo, was purchaſed by Ali Bey, who placed him among his Mamlouks.

Ahmad was not long in diſtinguiſhing himſelf by his courage and addreſs. His patron employed him on ſeveral occaſions in dangerous *coups de main*, ſuch as the aſſaſſination of ſuch beys and cachefs as he ſuſpected; of which commiſſions he acquitted himſelf ſo well as to acquire the name of *Djezzar*, which ſignifies *Cut-throat*. With this claim to his friendſhip, he enjoyed the favour of Ali until it was diſturbed by an accident.

This jealous Bey having proſcribed one of his benefactors called Saleh Bey, commanded Djezzar to cut off his head. Either from humanity or ſome ſecret friendſhip for the devoted victim, Djezzar heſitated, and even remonſtrated againſt the order. But learning the next day that Mohammed Bey had executed the commiſſion, and that Ali had ſpoken of him not very favourably, he thought himſelf a loſt man, and, to avoid the fate of Saleh Bey, eſcaped unobſerved, and reached Conſtantinople. He there ſolicited employments ſuitable to his former rank; but meeting, as is uſual in capitals, with a great number of rivals, he purſued another plan, and went to ſeek his fortune in Syria as a private ſoldier. Chance conducted him among the Druzes, where he was hoſpitably entertained, even in the houſe of the kiaya of the emir Youſef. From thence he repaired to Damaſcus, where he ſoon obtained the title of *Aga*, with a command of five pair of colours, that is to ſay, of 50 men; and he was thus ſituated when fortune deſtined him to the government of Bairout.

Djezzar was no ſooner eſtabliſhed there than he took poſſeſſion of it for the Turks. Youſef was confounded at this proceeding. He demanded juſtice at Damaſcus; but finding his complaints treated with contempt, entered into a treaty with Daher, and concluded an offenſive and defenſive alliance with him at Ras-el-aen, near to Sour. No ſooner was Daher united with the Druzes than he laid ſiege to Bairout by land, whilſt two Ruſſian frigates, whoſe ſervice was purchaſed by 600 purſes, cannonaded it by ſea. Djezzar was compelled to ſubmit to force, and, after a vigorous reſiſtance, gave up the city and ſurrendered himſelf priſoner. Shaik Daher, charmed with his courage, and flattered with the preference he had given him in the ſurrender, conducted him to Acre, and ſhowed him every mark of kindneſs. He even ventured to truſt him with a ſmall expedition into Paleſtine; but Djezzar, on approaching Jeruſalem, went over to the Turks and returned to Damaſcus.

The war of Mohammed Bey breaking out, Djezzar offered his ſervice to the captain Pacha, and gained his confidence. He accompanied him to the ſiege of Acre; and that admiral having deſtroyed Daher, and finding no perſon more proper than Djezzar to accompliſh the deſigns of the Porte in that country, named him pacha of Saide.

Being now, in conſequence of this revolution, ſuperior lord to the emir Youſef, Djezzar is mindful of injuries in proportion as he has reaſon to accuſe himſelf of ingratitude. By a conduct truly Turkiſh, feigning alternately gratitude and reſentment, he is alternately on terms of diſpute and reconciliation with him, continually exacting money as the price of peace, or as indemnity for war. His artifices have ſucceeded ſo well, that within the ſpace of five years he has extorted from the emir four millions of French money (above L.160,000), a ſum the more aſtoniſhing, as the farm of the country of the Druzes did not then amount to 100,000 livres (L.4000).

In 1784 he made war on him, depoſed him, and beſtowed the government on the emir of the country of Haſbeya, named Iſmael. Youſef, having once more purchaſed his favour, returned towards the end of the ſame year to Dair-el-Kamar, and even courted his confidence ſo far as to wait on him at Acre, from whence nobody expected him to return; but Djezzar is too cunning to ſhed blood while there are any hopes of getting money: he releaſed the prince, and ſent him back with every mark of friendſhip. Since that period the Porte has named him pacha of Damaſcus, while he alſo retained the ſovereignty of the pachalic of Acre, and of the country of the Druzes.

As to the religion of the Druzes: What has been already ſaid of the opinions of Mohammed-ben-Iſmael may be regarded as the ſubſtance of it. They practiſe neither circumciſion, nor prayers, nor faſting; they obſerve neither feſtivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and ſiſters, though not between fathers and children. From this we may conclude, with reaſon, that the Druzes have no religion; yet one claſs of them muſt be excepted, whoſe religious cuſtoms are very peculiar. Thoſe who compoſe it are to the reſt of the nation what the initiated were to the profane; they aſſume the name of *Okkals*, which means ſpiritualiſts, and beſtow on the vulgar the epithet of *Djahel* or ignorant; they have various degrees of initiation, the higheſt orders of which require celibacy. Theſe are diſtinguiſhable by the white turban they affect to wear, as a ſymbol of their purity; and ſo proud are they of this ſuppoſed purity, that they think themſelves ſullied by even touching a profane perſon. If you eat out of their plate, or drink out of their cup, they break them; and hence the cuſtom, ſo general in this country, of uſing vaſes with a ſort of cock, which may be drank out of without touching them with the lips. All their practices are enveloped in myſteries: their oratories always ſtand alone, and are conſtantly ſituated on eminences: in theſe they hold their ſecret aſſemblies, to which women are admitted. It is pretended they perform ceremonies there in preſence of a ſmall ſtatue reſembling an ox or a calf; whence ſome have pretended to prove that they are deſcended from the Samaritans. But beſides that the fact is not well aſcertained, the worſhip of the ox may be deduced from other ſources.

They have one or two books which they conceal

Druſes.

with the greateſt care: but chance has deceived their jealouſy; for in a civil war which happened 9 or 10 years ago, the emir Youſef, who is *Djabel* or ignorant, found one among the pillage of one of their oratories. M. Volney was aſſured, by perſons who had read it, that it contains only a myſtic jargon, the obſcurity of which doubtleſs renders it valuable to adepts. Hakèm Bamr-ellah is there ſpoken of, by whom they mean God incarnated in the perſon of the caliph. It likewiſe treats of another life, of a place of puniſhment, and a place of happineſs where the Okkals ſhall of courſe be moſt diſtinguiſhed. Several degrees of perfection are mentioned, to which they arrive by ſucceſſive trials. In other reſpects, theſe ſectaries have all the inſolence and all the fears of ſuperſtition: they are not communicative, becauſe they are weak; but it is probable that, were they powerful, they would be promulgators and intolerant.

The reſt of the Druzes, ſtrangers to this ſpirit, are wholly indifferent about religious matters. The Chriſtians who live in their country pretend that ſeveral of them believe in the metempſychoſis; that others worſhip the ſun, moon, and ſtars: all which is poſſible; for, as among the Anſaria, every one, left to his own fancy, follows the opinion that pleaſes him moſt; and theſe opinions are thoſe which preſent themſelves moſt naturally to unenlightened minds. When among the Turks, they affect the exterior of Mahometans, frequent the moſques, and perform their ablutions and prayers. Among the Maronites, they accompany them to church, and, like them, make uſe of holy water. Many of them, importuned by the miſſionaries, ſuffer themſelves to be baptized; and if ſolicited by the Turks, receive circumciſion, and conclude by dying neither Chriſtians nor Mahometans; but they are not ſo indifferent in matters of civil policy.

The Druzes may be divided into two claſſes: the common people; and the people of eminence and property, diſtinguiſhed by the title of ſhaiks and emirs, or deſcendants of princes. The greater part are cultivators, either as farmers or proprietors; every man lives on his inheritance, improving his mulberry-trees and vineyards: in ſome diſtricts they grow tobacco, cotton, and ſome grain, but the quantity of theſe is inconſiderable. It appears that at firſt all the lands were, as formerly in Europe, in the hands of a ſmall number of families. But to render them productive, the great proprietors were forced to ſell part of them, and let leaſes; which ſubdiviſion is become the chief ſource of the power of the ſtate, by multiplying the number of perſons intereſted in the public weal: there ſtill exiſts, however, ſome traces of the original inequality, which even at this day produces pernicious effects. The great property poſſeſſed by ſome families gives them too much influence in all the meaſures of the nation; and their private intereſts have too great weight in every public tranſaction. Their hiſtory, for ſome years back, affords ſufficient proofs of this; ſince all the civil or foreign wars in which they have been engaged have originated in the ambition and perſonal views of ſome of the principal families, ſuch as the Leſbeks, the Djambelats, the Iſmaels of Solyma, &c. The ſhaiks of theſe houſes, who alone poſſeſs one-tenth part of the country, procured creatures by their money, and at laſt involved all the Druzes in their diſſenſions. It muſt be owned, however, that poſſibly to this conflict between contending parties the whole nation owes the good fortune of never having been enſlaved by its chief.

This chief, called *Hakem* or governor, alſo *Emir* or prince, is a ſort of king or general, who unites in his own perſon the civil and military powers. His dignity is ſometimes tranſmitted from father to ſon, ſometimes from one brother to another; and the ſucceſſion is determined rather by force than any certain laws. Females can in no caſe pretend to this inheritance. They are already excluded from ſucceſſion in civil affairs, and conſequently can ſtill leſs expect it in political: in general, the Aſiatic governments are too turbulent, and their adminiſtration renders military talents too neceſſary, to admit of the ſovereignty of women. Among the Druzes, the male line of any family being extinguiſhed, the government devolves to him who is in poſſeſſion of the greateſt number of ſuffrages and reſources. But the firſt ſtep is to obtain the approbation of the Turks, of whom he becomes the vaſſal and tributary. It even happens, that, not unfrequently to aſſert their ſupremacy, they name the Haken, contrary to the wiſhes of the nation, as in the caſe of Iſmael Haſbeya, raiſed to that dignity by Djezzar; but this conſtraint laſts no longer than it is maintained by that violence which gave it birth. The office of the governor is to watch over the good order of the ſtate, and to prevent the Emirs, Shaiks, and villages, from making war on each other: in caſe of diſobedience, he may employ force. He is alſo at the head of the civil power, and names the Cadis, only always reſerving to himſelf the power of life and death. He collects the tribute, from which he annually pays to the pacha a ſtated ſum. This tribute varies in proportion as the nation renders itſelf more or leſs formidable: at the beginning of this century, it amounted to 160 purſes, L. 8330; but Melhem forced the Turks to reduce it to 60. In 1784, Emir Youſef paid 80 and promiſed 90. This tribute, which is called *Miri*, is impoſed on the mulberry-trees, vineyards, cotton, and grain. All ſown land pays in proportion to its extent; every foot of mulberries is taxed at three medins, or three ſols nine deniers (not quite two-pence). A hundred feet of vineyard pays a piaſter or 40 medins; and freſh meaſurements are often made to preſerve a juſt proportion. The ſhaiks and emirs have no exemption in this reſpect; and it may be truly ſaid they contribute to the public ſtock in proportion to their fortune. The collection is made almoſt without expence. Each man pays his contingent at Dair-el-Kamer, if he pleaſes, or to the collectors of the prince, who make a circuit round the country after the crop of ſilks. The ſurplus of this tribute is for the prince; ſo that it is his intereſt to reduce the demands of the Turks, as it would be likewiſe to augment the impoſt: but this meaſure requires the ſanction of the ſhaiks, who have the privilege of oppoſing it. Their conſent is neceſſary, likewiſe, for peace and war. In theſe caſes, the emir muſt convoke general aſſemblies, and lay before them the ſtate of his affairs. There every ſhaik, and every peaſant who has any reputation for courage or underſtanding, is intitled to give his ſuffrage; ſo that this government may be conſidered as a well-proportioned mixture of monarchy, ariſtocracy, and democracy. Every thing depends on circumſtanees: if the governor be a man of ability, he is abſolute; if weak, a cypher. This proceeds from the want of fixed laws; a want common to all Aſia, and the radical cauſe of all the diſorders in the governments of the Aſiatic nations.

Neither the chief nor the individual emirs maintain troops; they have only perſons attached to the domeſtic ſervice of their houſes, and a few black ſlaves. When the nation makes war, every man, whether ſhaik or peaſant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a muſket, ſome bullets, a ſmall quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. If it be a civil war, as ſometimes happens, the ſervants, the farmers, and their friends, take up arms for their patron, or the chief of their family, and repair to his ſtandard. In ſuch caſes, the parties irritated frequently ſeem on the point of proceeding to the laſt extremities; but they ſeldom have recourſe to acts of violence, or attempt the death of each other; mediators always interpoſe, and the quarrel is appeaſed the more readily as each patron is obliged to provide his followers with proviſions and ammunition. This ſyſtem, which produces happy effects in civil troubles, is attended with great inconvenience in foreign wars, as ſufficiently appeared in that of 1784. Djezzar, who knew that the whole army lived at the expence of the emir Youſef, aimed at nothing but delay, and the Druzes, who were not diſpleaſed at being fed for doing nothing, prolonged the operations; but the emir, wearied of paying, concluded a treaty, the terms of which were not a little rigorous for him, and eventually for the whole nation, ſince nothing is more certain than that the intereſts of a prince and his ſubjects are always inſeparable.

"The ceremonies to which I have been a witneſs on theſe occaſions (ſays M. Volney), bear a ſtriking reſemblance to the cuſtoms of ancient times. When the emir and the ſhaiks had determined on war at Daer-el-Kamar, cryers in the evening aſcended the ſummits of the mountain; and there began to cry with a loud voice: 'To war, to war; take your guns, take your piſtols: noble ſhaiks, mount your horſes; arm yourſelves with the lance and ſabre; rendezvous to morrow at Dair-el-Kamar. Zeal of God! zeal of combats!' This ſummons, heard from the neighbouring villages, was repeated there; and as the whole country is nothing but a chain of lofty mountains and deep valleys, the proclamation paſſed in a few hours to the frontiers. Theſe voices, from the ſtillneſs of the night, the long reſounding echoes, and the nature of the ſubject, had ſomething awful and terrible in their effect. Three days after 15000 armed men rendezvouzed at Dair-el-Kamar, and operations might have been immediately commenced.

"We may eaſily imagine that troops of this kind no way reſemble our European ſoldiers; they have neither uniforms, nor diſcipline, nor order. They are a crowd of peaſants with ſhort coats, naked legs, and muſkets in their hands; differing from the Turks and Mamlouks in that they are all foot; the ſhaiks and emirs alone having horſes, which are of little uſe from the rugged nature of the country. War there can only be a war of poſts. The Druzes never riſk themſelves in the plain; and with reaſon: for they would be unable to ſtand the ſhock of cavalry, having no bayonets to their muſkets. Their whole art conſiſts in climbing rocks, creeping among the buſhes and blocks of ſtone; from whence their fire is the more dangerous, as they are covered, fire at their eaſe, and by hunting and military ſports have acquired the habit of hitting a mark with great dexterity. They are accuſtomed to ſudden inroads, attacks by night, ambuſcades, and all thoſe *coups de main* which require to fall ſuddenly on, and come to cloſe fight with the enemy. Ardent in improving their ſucceſs, eaſily diſpirited, and prompt to reſume their courage; daring even to temerity, and ſometimes ferocious, they poſſeſs above all two qualities eſſential to the excellency of any troops; they ſtrictly obey their leaders, and are endowed with a temperance and vigour of health at this day unknown to moſt civilized nations. In the campaign of 1784, they paſſed three months in the open air without tents, or any other covering than a ſheep-ſkin; yet were there not more deaths or maladies than if they had remained in their houſes. Their proviſions conſiſted, as at other times, of ſmall loaves baked on the aſhes or on a brick, raw onions, cheeſe, olives, fruits, and a little wine. The table of the chiefs was almoſt as frugal; and we may affirm, that they ſubſiſted 100 days, on what the ſame number of Engliſhmen or Frenchmen would not have lived ten. They have no knowledge of the ſcience of fortification, the management of artillery or encampments, nor, in a word, any thing which conſtitutes the art of war. But had they among them a few perſons verſed in military ſcience, they would readily acquire its principles, and become a formidable ſoldiery. This would be the more eaſily effected, as their mulberry plantations and vineyards do not occupy them all the year, and they could afford much time for military exerciſes."

By the laſt eſtimates, according to M. Volney's information, the number of men able to bear arms was 40,000, which ſuppoſes a total population of 120,000: no addition is to be made to this calculation, ſince there are no Druzes in the cities or on the coaſt. As the whole country contains only 110 ſquare leagues, there reſults for every league 1090 perſons; which is equal to the population of our richeſt provinces. To render this more remarkable, it muſt be obſerved that the ſoil is not fertile, that a great many eminences remain uncultivated, that they do not grow corn enough to ſupport themſelves three months in the year, that they have no manufactures, and that all their exportations are confined to ſilks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Paleſtine, and the rice and coffee they procure from Bairout. Whence ariſes then ſuch a number of inhabitants within ſo ſmall a ſpace? "I can diſcover no other cauſe (ſays our author), than that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a perfect ſecurity of his life and property. The peaſant is not richer than in other countries; but he is free. 'He fears not,' as I have often heard them ſay, 'that the Aga, the Kaimmakam, or the Pacha ſhould ſend their Djendis to pillage his houſe, carry off his family, or give him the baſtinado.' Such oppreſſions are unknown among theſe mountains. Security, therefore, has been the original cauſe of population, from that inherent deſire which all men have to multiply themſelves wherever they find an eaſy ſubſiſtence. The frugality of the nation which is content with little, has been a ſecondary, and not leſs powerful reaſon; and a third is the emigration of a number of Chriſtian families, who daily deſert the Turkiſh provinces to ſettle in Mount Lebanon, where they are received with open arms by the Maronites from ſimilarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the intereſt of every country to multiply the number of its cultivators, conſumers, and allies.

“ The compariſon which the Druzes often have an opportunity of making between their ſituation and that of other ſubjects of the Turkiſh government, has given them an advantageous opinion of their ſuperiority, which, by a natural effect, has an influence on their perſonal character. Exempt from the violence and inſults of deſpotiſm, they conſider themſelves as more perfect than their neighbours, becauſe they have the good fortune not to be equally debaſed. Hence they acquire a character more elevated, energetic, and active; in ſhort, a genuine republican ſpirit. They are conſidered throughout the Levant as reſtleſs, enterpriſing, hardy, and brave even to temerity. Only 300 of them have been ſeen to enter Damaſcus in open day, and ſpread around them terror and carnage. No people are more nice than they with reſpect to the point of honour: Any offence of that kind, or open inſult, is inſtantly puniſhed by blows of the kandjur or the muſket; while among the inhabitants of the towns, it only excites injurious retorts. This delicacy has occaſioned in their manners and diſcourſe a reſerve, or, if you will, a politeneſs, which one is aſtoniſhed to diſcover among peaſants. It is carried even to diſſimulation and falſehood, eſpecially among the chiefs, whoſe greater intereſts demand greater attentions. Circumſpection is neceſſary to all, from the formidable conſequences of that retaliation of which I have ſpoken. Theſe cuſtoms may appear barbarous to us; but they have the merit of ſupplying the deficiency of regular juſtice, which is neceſſarily tedious and uncertain in theſe diſorderly and almoſt anarchical governments.

“ The Druzes have another point of honour, that of hoſpitality. Whoever preſents himſelf at their door in the quality of a ſuppliant or paſſenger, is ſure of being entertained with lodging and food in the moſt generous and unaffected manner. M. Volney often ſaw the loweſt peaſants give the laſt morſel of bread they had in their houſes to the hungry traveller; and when it was obſerved to them that they wanted prudence, their anſwer was, ‘ God is liberal and great, and all men are brethren.’ There are, therefore, no inns in their country any more than in the reſt of Turkey. When they have once contracted with their gueſt the ſacred engagement of bread and ſalt, no ſubſequent event can make them violate it. Various inſtances of this are related, which do honour to their character. A few years ago, an aga of the janiſſaries having been engaged in a rebellion, fled from Damaſcus and retired among the Druzes. The pacha was informed of this, and demanded him of the emir, threatening to make war on him in caſe of refuſal. The emir demanded him of the ſhaik Talhouk, who had received him; but the indignant ſhaik replied, ‘ When you have known the Druzes deliver up their gueſts? Tell the emir, that as long as Talhouk ſhall preſerve his beard, not a hair of the head of his ſuppliant ſhall fall!’ The emir threatened him with force; Talhouk armed his family. The emir, dreading a revolt, adopted a method practiſed as juridical in that country. He declared to the ſhaik, that he would cut down 50 mulberry-trees a-day until he ſhould give up the aga. He proceeded as far as a thouſand, and Talhouk ſtill remained inflexible. At length the other ſhaiks, enraged, took up the quarrel; and the commotion was about to become general, when the aga, reproaching himſelf with being the cauſe of ſo much miſchief, made his eſcape without the knowledge even of Talhouk.

“ The Druzes have alſo the prejudices of the Bedouins reſpecting birth; like them, they pay great reſpect to the antiquity of families; but this produces no eſſential inconveniences. The nobility of the emirs and ſhaiks does not exempt them from paying tribute in proportion to their revenues. It confers on them no prerogatives, either in the attainment of landed property or public employments. In this country, no more than in all Turkey, are they acquainted with game-laws, or glebes, or ſeigniorial or eccleſiaſtical tithes, franc fiefs or alienation fines; every thing is held in freehold: Every man, after paying his miri and his rent, is maſter of his property. In ſhort, by a particular privilege, the Druzes pay no fine for their ſucceſſion; nor does the emir, like the ſultan, arrogate to himſelf original and univerſal property: there exiſts, nevertheleſs, in the law of inheritance, an imperfection which produces diſagreeable effects. Fathers have, as in the Roman law, the power of preferring ſuch of their children as they think proper: hence it has happened in ſeveral families of the ſhaiks, that the whole property has centered in the ſame perſon, who has perverted it to the purpoſe of intriguing and caballing, while his relations remain, as they well expreſs it, *princes of olives and cheeſe*; that is to ſay, poor as peaſants.

“ In conſequence of their prejudices, the Druzes do not chooſe to make alliances out of their own families. They invariably prefer their relation, though poor, to a rich ſtranger; and poor peaſants have been known to refuſe their daughters to merchants of Saide and Bairout, who poſſeſſed from twelve to fifteen thouſand piaſtres. They obſerve alſo, to a certain degree, the cuſtom of the Hebrews, which directed that a brother ſhould eſpouſe his brother's widow; but this is not peculiar to them, for they retain that as well as ſeveral other cuſtoms of that ancient people, in common with other inhabitants of Syria and all the Arab tribes.

“ In ſhort, the proper and diſtinctive character of the Druzes is a ſort of republican ſpirit, which gives them more energy than any other ſubjects of the Turkiſh government, and an indifference for religion, which forms a ſtriking contraſt with the zeal of the Mahometans and Chriſtians. In other reſpects, their private life, their cuſtoms and prejudices, are the ſame with other orientals. They may marry ſeveral wives, and repudiate them when they chooſe; but, except by the emir and a few men of eminence, that is rarely practiſed. Occupied with their rural labours, they experience neither artificial wants, nor thoſe inordinate paſſions which are produced by the idleneſs of the inhabitants of cities and towns. The veil, worn by their women, is of itſelf a preſervative againſt thoſe deſires which are the occaſion of ſo many evils in ſociety.

ciety. No man knows the face of any other woman than his wife, his mother, his ſiſter, and ſiſters-in-law. Every man lives in the boſom of his own family, and goes little abroad. The women, thoſe even of the ſhaiks, make the bread, roaſt the coffee, waſh the linen, cook the victuals, and perform all domeſtic offices. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they ſometimes aſſemble in the court, the area, or houſe of the chief of the village or family. There, ſeated in a circle, with legs croſſed, pipes in their mouths, and poniards at their belts, they diſcourſe of their various labours, the ſcarcity or plenty of their harveſts, peace or war, the conduct of the emir, or the amount of the taxes; they relate paſt tranſactions, diſcuſs preſent intereſts, and form conjectures on the future. Their children, tired with play, come frequently to liſten; and a ſtranger is ſurpriſed to hear them, at ten or twelve years old, recounting, with a ſerious air, why Djezzar declared war againſt the emir Youſef, how many purſes it coſt that prince, what augmentation there will be of the miri, how many muſkets there were in the camp, and who had the beſt mare. This is their only education. They are neither taught to read the pſalms as among the Maronites, nor the koran like the Mahometans; hardly do the ſhaiks know how to write a letter. But if their mind be deſtitute of uſeful or agreeable information, at leaſt it is not preoccupied by falſe and hurtful ideas; and, without doubt, ſuch natural ignorance is well worth all our artificial folly. This advantage reſults from it, that their underſtandings being nearly on a level, the inequality of conditions is leſs perceptible. For, in fact, we do not perceive among the Druzes that great diſtance which, in moſt other ſocieties, degrades the inferior, without contributing to the advantage of the great. All, whether ſhaiks or peaſants, treat each other with that rational familiarity, which is equally remote from rudeneſs and ſervility. The grand emir himſelf is not a different man from the reſt: he is a good country gentleman, who does not diſdain admitting to his table the meaneſt farmer. In a word, their manners are thoſe of ancient times, and of that ruſtic life which marks the origin of every nation; and prove that the people among whom they are ſtill found are as yet only in the infancy of the ſocial ſtate."

DRUSIUS (John), a Proteſtant writer of great learning, born at Oudenarde in Flanders in 1555. He was deſigned for the ſtudy of divinity; but his father being outlawed, and deprived of his eſtate, they both retired to England, where the ſon became profeſſor of the oriental languages at Oxford: but upon the pacification of Ghent, they returned to their own country, where Druſius was alſo appointed profeſſor of the oriental languages. From thence he removed to Frieſland, where he was admitted Hebrew profeſſor in the univerſity of Franeker; the functions of which he diſcharged with great honour till his death in 1616. His works ſhow him to have been well ſkilled in Hebrew; and the States General employed him in 1600 to write notes on the moſt difficult paſſages in the Old Teſtament, with a penſion of 400 florins a-year: but being frequently diſturbed in this undertaking, it was not publiſhed till after his death. He held a vaſt correſpondence with the learned; for beſides letters in Hebrew, Greek, and other languages, there were found 2300 Latin letters among his papers. He had a ſon John, who died in England at 21, and was a prodigy for his early acquiſition of learning; he wrote Notes on the Proverbs of Solomon, with many letters and verſes in Hebrew.

DRYADS, in the heathen theology, a ſort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; theſe latter being attached to ſome particular tree, with which they were born, and with which they died; whereas the Dryades were goddeſſes of trees and woods in general. See HAMADRYADES.

DRYAS, in botany: A genus of the polygynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 35th order, *Senticoſæ*. The calyx is octofid; the petals eight; the ſeeds long and hairy with a train.

DRYDEN (John), one of the moſt eminent Engliſh poets of the 17th century, deſcended of a genteel family in Huntingdonſhire, was born in that county at Oldwincle 1631, and educated at Weſtminſter ſchool under Dr Buſhby. From thence he was removed to Cambridge in 1650, being elected ſcholar of Trinity-college, of which he appears, by his *Epithalamia Cantabrigienſ.* 4to, 1662, to have been afterwards a fellow. Yet in his earlier days he gave no extraordinary indication of genius; for even the year before he quitted the univerſity, he wrote a poem on the death of Lord Haſtings, which was by no means a preſage of that amazing perfection in poetical powers which he afterwards poſſeſſed.

On the death of Oliver Cromwell he wrote ſome heroic ſtanzas to his memory; but on the Reſtoration, being deſirous of ingratiating himſelf with the new court, he wrote firſt a poem intitled *Aſtræa Redux*, and afterwards a panegyric to the king on his coronation. In 1662, he addreſſed a poem to the lord chancellor Hyde, preſented on New Year's day; and in the ſame year a ſatire on the Dutch. In 1668 appeared his *Annus Mirabilis*, which was an hiſtorical poem in celebration of the duke of York's victory over the Dutch. Theſe pieces at length obtained him the favour of the crown; and Sir William Davenant dying the ſame year, Mr Dryden was appointed to ſucceed him as poet laureat. About this time alſo his inclination to write for the ſtage ſeems firſt to have ſhown itſelf. For beſides his concern with Sir William Davenant in the alteration of Shakeſpeare's Tempeſt, in 1669 he produced his Wild Gallants, a comedy. This met with very indifferent ſucceſs; yet the author, not being diſcouraged by its failure, ſoon publiſhed his Indian Emperor. This finding a more favourable reception, encouraged him to proceed; and that with ſuch rapidity, that in the key to the Duke of Buckingham's Rehearſal he is recorded to have engaged himſelf by contract for the writing of four plays per year; and, indeed, in the years 1679 and 1680 he appears to have fulfilled that contract. To this unhappy neceſſity that our author lay under, are to be attributed all thoſe irregularities, thoſe bombaſtic flights, and ſometimes even puerile exuberances, for which he has been ſo ſeverely criticiſed; and which, in the unavoidable hurry in which he wrote, it was impoſſible he ſhould find time either for lopping away or correcting.

In 1675, the Earl of Rocheſter, whoſe envious and malevolent diſpoſition would not permit him to ſee growing merit meet with its due reward, and was therefore ſincerely chagrined at the very juſt applauſe with which Mr Dryden's dramatic pieces had been received, was determined if poſſible to ſhake his intereſt at court; and ſucceeded ſo far as to recommend Mr Crowne, an author by no means of equal merit, and at that time of an obſcure reputation, to write a maſk for the court, which certainly belonged to Mr Dryden's office as poet laureat.—Nor was this the only attack, nor indeed the moſt potent one, that Mr Dryden's juſtly acquired fame drew on him. For, ſome years before, the Duke of Buckingham, a man of not much better character than Lord Rocheſter, had moſt ſeverely ridiculed ſeveral of our author's plays in his admired piece called the *Rehearſal*. But though the intrinſic wit which runs through that performance cannot even to this hour fail of exciting our laughter, yet at the ſame time it ought not to be the ſtandard on which we ſhould fix Mr Dryden's poetical reputation, if we conſider, that the pieces there ridiculed are not any of thoſe looked on as the *chef d'œuvres* of this author; that the very paſſages burleſqued are frequently, in their original places, much leſs ridiculous than when thus detached, like a rotten limb, from the body of the work; and expoſed to view with additional diſtortions, and diveſted of that connection with the other parts, which, while preſerved, gave it not only ſymmetry but beauty; and laſtly, that the various inimitable beauties, which the critic has ſunk in oblivion, are infinitely more numerous than the deformities which he has thus induſtriouſly brought forth to our more immediate inſpection.

Mr Dryden, however, did not ſuffer theſe attacks to paſs with impunity; for in 1679 there came out an Eſſay on Satire, ſaid to be written jointly by that gentleman and the Earl of Mulgrave, containing ſome very ſevere reflections on the Earl of Rocheſter and the Ducheſs of Portſmouth, who, it is not improbable, might be a joint inſtrument in the above-mentioned affront ſhown to Mr Dryden; and in 1681 he publiſhed his Abſalom and Achitophel, in which the well-known character of Zimri, drawn for the Duke of Buckingham, is certainly ſevere enough to repay all the ridicule thrown on him by that nobleman in the character of Bays.—The reſentment ſhown by the different peers was very different. Lord Rocheſter, who was a coward as well as a man of the moſt depraved morals, baſely hired three ruffians to cudgel Dryden in a coffeehouſe: but the Duke of Buckingham, as we are told, in a more open manner, took the taſk upon himſelf: and at the ſame time preſented him with a purſe containing no very trifling ſum of money; telling him, that he gave him the beating as a puniſhment for his impudence, but beſtowed that gold on him as a reward for his wit.

In 1680 was publiſhed a tranſlation of Ovid's Epiſtles in Engliſh verſe by ſeveral hands, two of which, together with the preface, were by Mr Dryden; and in 1682 came out his *Religio Laici*, deſigned as a defence of revealed religion, againſt Deiſts, Papiſts, &c. Soon after the acceſſion of King James II. our author changed his religion for that of the church of Rome, and wrote two pieces in vindication of the Romiſh tenets; *viz.* A Defence of the Papers written by the late King, found in his ſtrong box; and the celebrated poem, afterwards anſwered by Lord Halifax, intitled The Hind and the Panther.—By this extraordinary ſtep he not only engaged himſelf in controverſy, and incurred much cenſure and ridicule from his cotemporary wits; but on the completion of the Revolution, being, on account of his newly-choſen religion, diſqualified from bearing any office under the government, he was ſtripped of the laurel, which, to his ſtill greater mortification, was beſtowed on Richard Flecknoe, a man to whom he had a moſt ſettled averſion. This circumſtance occaſioned his writing the very ſevere poem called *Mac Flecknoe*.

Mr Dryden's circumſtances had never been affluent; but now being deprived of this little ſupport, he found himſelf reduced to the neceſſity of writing for mere bread. We conſequently find him from this period engaged in works of labour as well as genius, *viz.* in tranſlating the works of others; and to this neceſſity perhaps our nation ſtands indebted for ſome of the beſt tranſlations extant. In the year he loſt the laurel, he publiſhed the life of St Francis Xavier from the French. In 1693 came out a tranſlation of Juvenal and Perſius; in the firſt of which he had a conſiderable hand, and of the latter the entire execution. In 1695 was publiſhed his proſe verſion of Freſnoy's Art of Painting; and the year 1697 gave the world that tranſlation of Virgil's works entire, which ſtill does, and perhaps ever will, ſtand foremoſt among the attempts made on that author. The petite pieces of this eminent writer, ſuch as prologues, epilogues, epitaphs, elegies, ſongs, &c. are too numerous to ſpecify here, and too much diſperſed to direct the reader to. The greateſt part of them, however, are to be found in a collection of miſcellanies in 6 vols 12mo. His laſt work is what is called his *Fables*, which conſiſts of many of the moſt intereſting ſtories in Homer, Ovid, Boccace, and Chaucer, tranſlated or modernized in the moſt elegant and poetical manner; together with ſome original pieces, among which is that amazing ode on St Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and diſtreſs conſpired as it were to damp his poetic ardor and clip the wings of fancy, yet poſſeſs ſo much of both, as would be ſufficient to have rendered him immortal had he never written a ſingle line beſides.

Dryden married the lady Elizabeth Howard, ſiſter to the Earl of Berkſhire, who ſurvived him eight years; though for the laſt four of them ſhe was a lunatic, having been deprived of her ſenſes by a nervous fever.—By this lady he had three ſons; Charles, John, and Henry. Of the eldeſt of theſe there is a circumſtance related by Charles Wilſon, Eſq; in his Life of Congreve, which ſeems ſo well atteſted, and is itſelf of ſo very extraordinary a nature, that we cannot avoid giving it a place here.—Dryden, with all his underſtanding, was weak enough to be fond of judicial aſtrology, and uſed to calculate the nativity of his children. When his lady was in labour with his ſon Charles, he being told it was decent to withdraw, laid his watch on the table, begging one of the ladies then preſent, in a moſt ſolemn manner, to take exact notice of the very minute that the child was born; which ſhe did, and acquainted him with it. About a week after, when his lady was pretty well recovered, Mr Dryden took occaſion to tell her that he had been calculating the child's nativity; and obſerved, with grief, that he was born in an evil hour: for Jupiter, Venus, and the Sun, were all under the earth, and the lord of his aſcendant afflicted with a hateful ſquare of Mars and Saturn. "If he lives to arrive at the 8th year," ſays he, "he will go near to die a violent death on his very birth-day; but if he ſhould eſcape, as I ſee but ſmall hopes, he will in the 23d year be under the very ſame evil direction; and if he ſhould eſcape that alſo, the 33d or 34th year is, I fear"——Here he was interrupted by the immoderate grief of his lady, who could no longer hear calamity propheſied to befal her ſon. The time at laſt came, and Auguſt was the inauſpicious month in which young Dryden was to enter into the eighth year of his age. The court being in progreſs, and Mr Dryden at leiſure, he was invited to the country-ſeat of the Earl of Berkſhire his brother-in-law, to keep the long vacation with him in Charleton in Wilts; his lady was invited to her uncle Mordaunt's to paſs the remainder of the ſummer. When they came to divide the children, lady Elizabeth would have him take John, and ſuffer her to take Charles: but Mr Dryden was too abſolute, and they parted in anger; he took Charles with him, and ſhe was obliged to be content with John. When the fatal day came, the anxiety of the lady's ſpirits occaſioned ſuch an efferveſcence of blood, as threw her into ſo violent a fever, that her life was deſpaired of, till a letter came from Mr Dryden, reproving her for her womaniſh credulity, and aſſuring her that her child was well; which recovered her ſpirits, and in ſix weeks after ſhe received an ecclairciſſement of the whole affair. Mr Dryden, either through fear of being reckoned ſuperſtitious, or thinking it a ſcience beneath his ſtudy, was extremely cautious of letting any one know that he was a dealer in aſtrology; therefore could not excuſe his abſence, on his ſon's anniverſary, from a general hunting-match which Lord Berkſhire had made, to which all the adjacent gentlemen were invited. When he went out, he took care to ſet the boy a double exerciſe in the Latin tongue, which he taught his children himſelf, with a ſtrict charge not to ſtir out of the room till his return; well knowing the taſk he had ſet him would take up longer time. Charles was performing his duty in obedience to his father; but, as ill fate would have it, the ſtag made towards the houſe; and the noiſe alarming the ſervants, they haſted out to ſee the ſport. One of them took young Dryden by the hand, and led him out to ſee it alſo; when, juſt as they came to the gate, the ſtag being at bay with the dogs, made a bold puſh, and leaped over the court-wall, which was very low and very old; and the dogs following, threw down a part of the wall 10 yards in length, under which Charles Dryden lay buried. He was immediately dug out; and after ſix weeks languiſhing in a dangerous way, he recovered. So far Dryden's prediction was fulfilled. In the 23d year of his age, Charles fell from the top of an old tower belonging to the Vatican at Rome, occaſioned by a ſwimming in his head with which he was ſeized, the heat of the day being exceſſive. He again recovered, but was ever after in a languiſhing ſickly ſtate. In the 33d year of his age, being returned to England, he was unhappily drowned at Windſor. He had with another gentleman ſwam twice over the Thames; but returning a third time, it was ſuppoſed he was taken with the cramp, becauſe he called out for help, though too late. Thus the father's calculation proved but too prophetical.

At laſt, after a long life, haraſſed with the moſt laborious of all fatigues, *viz.* that of the mind, and continually made anxious by diſtreſs and difficulty, our author departed this life on the firſt of May 1701.—The day after Mr Dryden's death, the dean of Weſtminſter ſent word to Mr Dryden's widow, that he would make a preſent of the ground and all other abbey-fees for the funeral: the Lord Halifax likewiſe ſent to the lady Elizabeth, and to Mr Charles Dryden, offering to defray the expences of our poet's funeral, and afterwards to beſtow 500 l. on a monument in the abbey; which generous offer was accepted. Accordingly, on Sunday following, the company being aſſembled, the corpſe was put into a velvet hearſe, attended by 18 mourning coaches. When they were juſt ready to move, Lord Jefferys, ſon of Lord Chancellor Jefferys, a name dedicated to infamy, with ſome of his rakiſh companions, riding by, aſked whoſe funeral it was; and being told it was Mr Dryden's, he proteſted he ſhould not be buried in that private manner; that he would himſelf, with the lady Elizabeth's leave, have the honour of the interment, and would beſtow 1000 l. on a monument in the abbey for him. This put a ſtop to their proceſſion; and the Lord Jefferys, with ſeveral of the gentlemen who had alighted from their coaches, went up ſtairs to the lady, who was ſick in bed. His lordſhip repeated the purport of what he had ſaid below; but the lady Elizabeth refuſing her conſent, he fell on his knees, vowing never to riſe till his requeſt was granted. The lady under a ſudden ſurpriſe fainted away; and Lord Jefferys, pretending to have obtained her conſent, ordered the body to be carried to Mr Ruſſel's an undertaker in Cheapſide, and to be left there till further orders. In the mean time the abbey was lighted up, the ground opened, the choir attending, and the biſhop waiting ſome hours to no purpoſe for the corpſe. The next day Mr Charles Dryden waited on the Lord Halifax and the biſhop; and endeavoured to excuſe his mother, by relating the truth. Three days after, the undertaker, having received no orders, waited on the Lord Jefferys; who pretended that it was a drunken frolic, that he remembered nothing of the matter, and he might do what he pleaſed with the body. Upon this the undertaker waited upon the lady Elizabeth, who deſired a day's reſpite, which was granted. Mr Charles Dryden immediately wrote to the Lord Jefferys, who returned for anſwer, that he knew nothing of the matter, and would be troubled no more about it. Mr Dryden hereupon applied again to Lord Halifax and the Biſhop of Rocheſter, who abſolutely refuſed to do any thing in the affair.

In this diſtreſs, Dr Garth, who had been Mr Dryden's intimate friend, ſent for the corpſe to the college of phyſicians, and propoſed a ſubſcription; which ſucceeding, about three weeks after Mr Dryden's deceaſe, Dr Garth pronounced a fine Latin oration over the body, which was conveyed from the college, attended by a numerous train of coaches to Weſtminſter-abbey, but in very great diſorder. At laſt the corpſe arrived at the abbey, which was all unlighted. No organ played, Dryden.

ed, no anthem ſung; only two of the ſinging boys preceding the corpſe, who ſung an ode of Horace, with each a ſmall candle in their hand. When the funeral was over, Mr Charles Dryden ſent a challenge to Lord Jefferys; who refuſing to anſwer it, he ſent ſeveral others, and went often himſelf; but could neither get a letter delivered, nor admittance to ſpeak to him: which ſo incenſed him, that finding his Lordſhip refuſed to anſwer him like a gentleman, he reſolved to watch an opportunity, and brave him to fight, though with all the rules of honour; which his Lordſhip hearing, quitted the town, and Mr Charles never had an opportunity to meet him, though he ſought it to his death with the utmoſt application.

Mr Dryden had no monument erected to him for ſeveral years; to which Mr Pope alludes in his epitaph intended for Mr Rowe, in this line,

> Beneath a rude and nameleſs ſtone he lies.

In a note upon which we are informed that the tomb of Mr Dryden was erected upon this hint by Sheffield duke of Buckingham, to which was originally intended this epitaph:

> This *Sheffield* rais'd.—The ſacred duſt below
> Was *Dryden* once; the reſt, who does not know?

Which was ſince changed into the plain inſcription now upon it, *viz.*

J. DRYDEN,
Natus Aug. 9. 1631.
Mortuus Maii 1. 1701.
Johannes Sheffield, dux Buckinghamienſis fecit.

Mr Dryden's character has been very differently drawn by different hands, ſome of which have exalted it to the higheſt degree of commendation, and others debaſed it by the ſevereſt cenſure.—The latter, however, we muſt charge to that ſtrong ſpirit of party which prevailed during great part of Dryden's time, and ought therefore to be taken with great allowances. Were we indeed to form a judgment of the author from ſome of his dramatic writings, we ſhould perhaps be apt to conclude him a man of the moſt licentious morals; many of his comedies containing a great ſhare of looſeneſs, even extending to obſcenity: But if we conſider, that, as the poet tells us,

> Thoſe who live to pleaſe, muſt pleaſe to live;

if we then look back to the ſcandalous licence of the age he lived in, the indigence which at times he underwent, and the neceſſity he conſequently lay under of complying with the public taſte however depraved; we ſhall ſurely not refuſe our pardon to the compelled writer, nor our credit to thoſe of his cotemporaries who were intimately acquainted with him, and who have aſſured us there was nothing remarkably vicious in his perſonal character.

From ſome parts of his hiſtory he appears unſteady, and to have too readily temporized with the ſeveral revolutions in church and ſtate. This however might in ſome meaſure have been owing to that natural timidity and diffidence in his diſpoſition, which almoſt all the writers ſeem to agree in his poſſeſſing. Congreve, whoſe authority cannot be ſuſpected, has given us ſuch an account of him, as makes him appear no leſs amiable in his private character as a man, than he was illuſtrious in his public one as a poet. In the former light, according to that gentleman, he was humane, compaſſionate, forgiving, and ſincerely friendly: of an extenſive reading, a tenacious memory, and a ready communication: gentle in the correction of the writings of others, and patient under the reprehenſion of his own deficiencies: eaſy of acceſs himſelf, but ſlow and diffident in his advances to others; and of all men the moſt modeſt and the moſt eaſy to be diſcountenanced in his approaches either to his ſuperiors or his equals. As to his writings, he is perhaps the happieſt in the harmony of his numbers, of any poet who ever lived either before or ſince his time, not even Mr Pope himſelf excepted. His imagination is ever warm, his images noble, his deſcriptions beautiful, and his ſentiments juſt and becoming. In his proſe he is poetical without bombaſt, conciſe without pedantry, and clear without prolixity. His dramatic have, perhaps, the leaſt merit of all his writings. Yet there are many of them which are truly excellent; though he himſelf tells us that he never wrote any thing in that way to pleaſe himſelf but his *All for Love*. This laſt, indeed, and his *Spaniſh Friar*, may be reckoned two of the beſt plays our language has been honoured with.

Drypis, Dublin.

DRYPIS, in botany: A genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is quinquedentated; the petals five; the opening at the capſule as if cut round horizontally, monoſpermous.

DUBLIN, the metropolis of Ireland, the ſecond city in his majeſty's dominions, and eſteemed the fifth for magnitude in Europe, is ſituated in the province of Leinſter, in the county of Dublin, at the bottom of a large bay. The river Liffey, which here diſembogues itſelf into the ocean, divides the town into nearly two equal parts. Formerly the city of Dublin was confined to the ſouth ſide of the river: it was a place of great antiquity. Ptolemy, who flouriſhed in the reign of Antoninus Pius, about the year 140, ſays, it was anciently called *Aſchcled*. In 155, Alpinus, whoſe daughter Auliana was drowned in the Liffey, changed the name from *Aſchcled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, whence comes *Dublinum* and *Dublin*, is evidently derived from *Dub-leana*, "the place of the black harbour or lake," or rather "the lake of the ſea," the bay of Dublin being frequently ſo called. This city has had a variety of names. The Iriſh call it *Drom-choll-coil*, "the brow of a hazle wood;" and in 181, Eogan king Munſter being on a royal tour, paid a viſit to this place, which was then called *Atha Cliath-Dubb-Line*, "the paſſage of the ford of hurdles over the black pool:" the harbour of Dublin was likewiſe known by the name of *Lean-Cliath*, or *Leam-Cliath*, from *Lean* or *Leam*, "a harbour;" and from *Cliath* or *Cliabh*, which literally ſignifies "a hurdle or any thing made of wicker-work;" it alſo ſignified certain wires formed with hurdles, and placed in rivers and bays by the ancient Iriſh for the purpoſe of taking fiſh: whence any river or bay wherein theſe wires were fixed had the name of *Cliath* or *Cliabh* annexed to it, to ſignify the eſtabliſhment of a fiſhery. Dublin, therefore, being originally built on or near one of theſe harbours, was anciently called *Baly-lean-Cliath*, that is, the town on the fiſhing harbour. It is deſcribed at the preſent day in the Iriſh language by the appellations of *Ath-Cliath*, "the ford of hurdles," and *Bally-ath-Cliath*, "the town of the ford:

ford of hurdles," the inhabitants having formerly had acceſs to the river by hurdles laid on the low marſhy grounds adjoining the water: and this name was alſo extended to the north ſide of the river, from a temporary bridge of hurdles thrown over the Anna Liffey, a corruption of *Auin Louiſſa*, or "the ſwift river," ſo termed from the rapidity of the mountain floods. This ſide was enlarged by Mac Turkill the Daniſh prince, who, notwithſtanding, fixed his habitation on the ſouth ſide, and abandoned the northern town; which, from the original country of the invaders, was called *Eaſtmantown*, ſince corrupted to *Oxmantown*. King Edgar, in the preface to his charter dated 964, mentions Ireland with its moſt noble city (*nobiliſſima civitas*) of *Dublin*. By the Fingallians it is called *Divelin*, and by the Welch *Dinas-Dulin*, or *the city of Duin*.

In 448, Alpin Mac Eachard, king of Dublin and all his ſubjects, were converted to Chriſtianity by St Patrick.

In the year 498, the Oſtmen or Danes having entered the Liffey with a fleet of 60 ſail, made themſelves maſters of Dublin and the adjacent country, and ſoon after environed the city with walls. About 1170 Dermot Mac Murrough, king of Leinſter, having quarrelled with the other princes of the kingdom, a confederacy was formed againſt him by Roderick O'Conor, monarch of Ireland. Dermot applied to Henry II. king of England, who ſent over a number of Engliſh adventurers, by whoſe aſſiſtance he was reinſtated in his dominions; and in the year 1171, the deſcendants of the Danes ſtill continuing to hold poſſeſſion of Dublin, it was beſieged and taken by a powerful party of the Engliſh under Raymond le Groſs. Mac Turkill the Daniſh king eſcaped to his ſhipping: he returned, however, ſoon after with a ſtrong fleet to recover the city, but was killed in the attempt, and in him ended the race of eaſterling princes in Ireland.

In 1172, Henry II. landed at Waterford, and obtained from Richard earl of Strongbow (who married the daughter of Dermot Mac Murrough, and by compact was his ſucceſſor) a ſurrender of the city of Dublin, where he built a pavilion of wicker work near St Andrew's church, then ſituated where Caſtlemarket lately ſtood, and there entertained ſeveral Iriſh princes, who voluntarily ſubmitted to him, on condition of being governed by the ſame laws as the people of England. Henry alſo held a parliament here. In 1173 he granted his firſt charter to Dublin, and by divers privileges encouraged a colony from Briſtol to ſettle here.

In 1210, upwards of 20 Iriſh princes ſwore allegiance to king John at Dublin; engaging to eſtabliſh the Engliſh laws and cuſtoms in the kingdom; and in the ſame year courts of judicature were inſtituted. In 1216, magna charta was granted to the Iriſh by Henry III. an entry of which was made in the red book of the exchequer at Dublin. In 1217, the city was granted to the citizens in fee farm at 200 marks *per annum;* and in 1227 the above monarch ordained that the charter granted by king John ſhould be kept inviolably. In 1404, the ſtatutes of Kilkenny and Dublin were confirmed in a parliament held at this city under the earl of Ormond. The charter of the city of Dublin was renewed in 1609 by James I.

The civil government of the city was anciently under the management of a provoſt and bailiffs; in 1308, John le Decer was appointed the firſt provoſt, and Richard de St Olave and John Stakebold bailiffs. In 1409, the title of the chief magiſtrate was changed to that of mayor, when Thomas Cuſack was appointed to the office, Richard Bove and Thomas Shortall being bailiffs: the office of bailiffs was changed to ſheriffs in 1547. In 1660, Charles II. gave a collar of SS. and a company of foot guards to the mayor; and in 1665, this monarch conferred the title of lord mayor on the chief magiſtrate, to whom he alſo granted 500l. *per annum* in lieu of the foot company. Sir Daniel Bellingham was the firſt lord mayor of Dublin; Charles Lovet and John Quelſh were ſheriffs the ſame year. In 1672, Arthur earl of Eſſex introduced new rules for the better government of the city; and in 1683 the Tholſel was built, for the purpoſe of the magiſtrates meeting to hold their courts, aſſemblies, &c.

In the 10th century, after the fortifications of Dublin were repaired by the Oſtmen, the walls of the city, including thoſe of the caſtle, did not occupy more than an Iriſh mile; they extended from Winetavern-gate to Audeon's-arch, and were continued from thence to where Newgate formerly ſtood; and from a plan publiſhed by John Speed in 1610, it appears that they were continued to Ormond's-gate, or, as it has been ſince called, *Wormwood-gate*, from thence to the Old-bridge, and along the banks of the river to a very large portal called *Newman's tower*, nearly in the preſent ſite of the ſouth entrance of Eſſex-bridge; and from Newman's tower in an angular direction to Dame's-gate, at the weſt-end of Dame-ſtreet. From the gate at the ſouth-weſt angle of the caſtle the wall ran to Nicholas-gate, and was continued from thence to Newgate. The principal ſtreets without the walls were, on the weſt, New-row, Francis-ſtreet, Thomas-ſtreet, and James's-ſtreet; on the ſouth were Patrick-ſtreet, Bride-ſtreet, and Ship-ſtreet; and on the eaſt Dame-ſtreet, George's-lane, and Stephen-ſtreet. That ſpace of ground now occupied by Crane-lane, Temple-bar, Fleet-ſtreet, Lazar's-hill, or, as it is now called *South Townſend-ſtreet*, Crampton, Aſton's, George's, and Sir John Rogerſon's quays, &c. was then overflowed by the Liffey. On the north ſide of the river there were only Church-ſtreet, Mary's-lane, Hammond-lane, and Pill-lane, then built but on one ſide as far as Mary's-abbey, which terminated the extent of that part of the town to the eaſtward; Grange-Gorman, Stoney-batter, now called *Manor-ſtreet*, and Glaſſmanogue, were then villages at ſome diſtance from the city; and at the latter the ſheriffs have held their courts in times of the plague, as being remote from the ſtage of infection. In 1664, the inhabitants being numbered amounted to 2565 men and 2986 women, proteſtants; and 1202 men and 1406 women, Roman catholics, making in the whole 8159.

By comparing this account of the ancient ſtate and boundaries of the metropolis with the following deſcription of its preſent extent, population, and magnificence, an idea will be readily formed of the amazing increaſe and improvement it hath experienced within the preſent century.

Dublin is ſeated in view of the ſea on the eaſt, and a fine country which ſwells into gently riſing eminences on the north and weſt, while it towers boldly up in lofty mountains that bound the horizon on the ſouth. The city itſelf cannot be ſeen to full advantage on entering the harbour: but the approach to it from thence exhibits a fine proſpect of the country for improvement and cultivation, interſperſed with numerous villas, that have a moſt agreeable effect to enliven this delightful ſcene, which, beginning at the water's edge, is continued all over the coaſt to the northward of the bay as far as the eye can reach, and is finely contraſted by a diſtant view of the Wicklow mountains to the ſouth, where the conical hills, called the *Sugar-loaves*, contribute not a little, by the ſingularity of their appearance, to embelliſh the landſcape, ſo extenſive and pictureſque as not to be equalled by any natural ſcenery in Europe, but the entrance of the bay of Naples, to which it bears a very ſtriking reſemblance.

The form of Dublin is nearly a ſquare, a figure that includes the largeſt area proportioned to its circumference. From the royal hoſpital at Kilmainham, at the weſtern extremity of the town, to the eaſt end of Townſend-ſtreet, the length is two miles and an half, and its greateſt breadth is computed to be of the ſame extent: hence the city is about 10 miles in circumference. Its increaſe within the laſt twenty years has been amazing: it now contains about 22,000 houſes, whoſe inhabitants are eſtimated at 156,000.

Dublin, with reſpect to its ſtreets, bears a near reſemblance to London. Some of the old ſtreets were formerly narrow: but this defect is now in a great meaſure remedied by an act of parliament, paſſed in 1774, for opening the public avenues, taking down ſign-poſts, paliſades, pent-houſes, &c. new paving the ſtreets, and flagging the foot paſſages: and, in 1785, another act paſſed for the better paving, cleanſing, and lighting the city; in conſequence of which an additional number of globes with double burners were put up at the diſtance of 36 feet from each other. Theſe neceſſary improvements contribute exceedingly to the beauty and convenience of the metropolis: the new ſtreets are wide and commodious, the houſes lofty, uniform, and elegant; nor are ſeveral of the old ſtreets totally deficient in theſe reſpects: Sackville-ſtreet, or the Mall, which, though built upwards of 40 years ago, has been included in the number of our new ſtreets by all the late geographers (a ſelf-evident proof that theſe writers had not even ſeen the city), is a noble avenue, with a gravel walk in the centre, encloſed by a wall of about three feet high; this walk is 36 feet and a half broad, and the diſtance between it and the paliſades fronting the houſes, on either ſide, is 42 feet and a half: when the new cuſtom-houſe is completed, this ſtreet will be then a moſt deſirable ſituation for wholeſale merchants, not only on account of its proximity to that building, but its great depth in the rere. Some years ago, it was eſteemed one of the fineſt public avenues in Europe: many of the new ſtreets, however, in this city are now much ſuperior to it in the magnificence and uniformity of the houſes. Among theſe, on the north ſide of the river, in the ſame quarter with Sackville-ſtreet, are Gardiner's-row, north Great George's-ſtreet, Cranby-row, Cavendiſh-row, and Palace-row: the laſt three form a ſuperb ſquare, having the garden of the lying-in-hoſpital in the centre: the old wall that encompaſſed the garden has been lately taken down; there is now a full view of this delightful ſpot ſurrounded with iron paliſades, and upward of 100 globes with double burners diſpoſed at equal diſtances, which, added to the globes from the ſurrounding houſes, have a moſt brilliant effect. This ſquare, which, for its ſize, is not perhaps to be equalled, has lately received the name of Rutland-ſquare, in compliment to his grace the preſent duke of Rutland, who contributed munificently towards the improvements in the encloſure of the new garden, and the erecting an elegant edifice for a ball and ſupper rooms, now nearly finiſhed, ſituated to the eaſt of the hoſpital.

Among the new ſtreets and buildings on the ſouth ſide of the river, thoſe wherein perſons of diſtinction reſide, lie chiefly to the eaſtward of the college and Stephen's-green; which laſt, though it does not rank with the new buildings, poſſeſſes much grandeur and elegance, being one of the largeſt ſquares in Europe: it is an Engliſh mile in circumference, ſurrounded by a gravel walk planted on each ſide with trees; within this walk is a ſmooth level meadow, having in the centre an equeſtrian ſtatue of the late king: there are ſeveral fine edifices, though almoſt all differing in the ſtile of their architecture; this variety, however, is eſteemed by many rather a beauty than a defect: but, beſides the other ſtreets and buildings in this quarter, there is a new ſquare which will be nearly as extenſive as Stephen's-green, called *Merion-ſquare*; it was laid out ſome years ago, by the late lord Fitzwilliam; the buildings are now conſiderably advanced, and great encouragement has been given by the preſent noble proprietor: the houſes on the north ſide, which is quite finiſhed, are uniform and lofty; moſt of them, being carried up with hewn ſtone to the firſt ſtory, gives the whole an air of ſtrength, beauty, and magnificence. At the ſouth weſt angle of Stephen's-green, a new ſtreet has been alſo opened, called *Harcourt-ſtreet*, in which are ſeveral elegant ſtructures that merit notice, particularly the town reſidence of the right honourable lord Earlsford.

The principal entrance to the walks of Stephen's-green is on the weſt ſide oppoſite the end of York-ſtreet (which may be properly claſſed among the new ſtreets), as all the old houſes have been pulled down, and modern buildings erected in their room. Thoſe parts of the city inhabited by merchants and traders begin to wear a new face; and amongſt this number the new buildings of Dame-ſtreet on the ſouth ſide, exhibit an extenſive, uniform, and beautiful range of houſes all of an equal height: the ſhop doors and windows are formed by arches, exactly ſimilar in their conſtruction and ornaments, which are ſimply elegant: when the other ſide of this ſtreet ſhall be rebuilt, it may be juſtly pronounced one of the firſt trading ſtreets in Europe; and Parliament-ſtreet, which was built ſome years ago, is now nearly equal to any trading ſtreet in London.

The river Liffey, being banked in through the whole length of the town, exhibits ſpacious and beautiful quays, where veſſels below the bridge load and unload before the merchants doors and warehouſes: it is navigable as far as Eſſex-bridge. This bridge was firſt built in 1681, and took its name from the unfortunate earl of Eſſex, then viceroy of Ireland. It was taken down in 1753, and rebuilt in an elegant form, after the model of Weſtminſter bridge, but much better proportioned, and on a more ſecure foundation. It has five arches, the buttreſſes between which ſupport ſemicircular niches that project from the parapet; there are balluſtrades between theſe niches, and continued to the ends of the bridge, which is commodiouſly flagged for foot paſſages; the whole conſtructed with hewn ſtone in a very fine taſte. There are four bridges beſides this over the river; three of which have nothing to recommend them, further than the antiquity of the Old-Bridge, which was erected in this city at a very early period, when it had the name of *Dublin-Bridge;* it was rebuilt in 1428, ſince which time it received its preſent title. Bloody-bridge, built in 1671, was originally conſtructed with wood, and derives it preſent harſh appellation from an attempt to break it down, wherein four perſons were killed. Ormond-bridge was built in 1684, during the Ormond adminiſtration. Arran-bridge, now called *Queen's-bridge,* was erected in the ſame year; but, being deſtroyed by the floods in 1763, was rebuilt of hewn ſtone, and finiſhed in 1768. It conſiſts of three arches, with flagged foot paſſages, ſtone balluſtrades and ornamental decorations, in a handſome light ſtyle, admired by every amateur of the arts.

This city has 2 cathedrals, 18 pariſh churches, 2 chapels of eaſe, 15 Roman-catholic chapels, 6 meeting-houſes for preſbyterians, 1 for anabaptiſts, 4 for methodiſts, 2 for quakers, a church for French Calviniſts, a Daniſh and a Dutch church, and a Jewiſh ſynagogue.

Chriſt-church, or the Holy Trinity, built in 1038 by Donat biſhop of Dublin, to whom Sitricus the ſon of Amlave king of the Oſtmen of Dublin granted the ſite for that purpoſe, ſtands on the ſummit of the riſing ground at the head of Winetavern-ſtreet. It is a venerable Gothic pile; and its preſent appearance evinces its antiquity. St Patrick's cathedral, firſt built by archbiſhop Comyn in 1190, and decorated by archbiſhop Minot in 1370, with a ſteeple on which a lofty ſpire was erected in 1750, is alſo a fine Gothic ſtructure: it ſtands on the eaſt ſide of Patrick-ſtreet; the monuments here are more numerous than in Chriſt-church; and the ſteeple is the higheſt in the city.

St Werburgh's church was originally built in a very early age. In 1301, when a great part of the city was conſumed by an accidental fire, this church ſuffered in the conflagration: it was burnt a ſecond time in 1754, and repaired in its preſent beautiful form in 1759. The front and ſteeple are admired for their elegance, lightneſs, and ſymmetry: the ſpire is a fine octagon ſupported by eight pillars; and a gilt ball terminates the whole, being 160 feet from the ground. Catharine's church firſt built in 1105, and re-edified in its preſent form in 1769, is ſituated on the ſouth ſide of Thomas's-ſtreet. St Thomas's church is the lateſt foundation of the kind in this city, having been begun in the year 1758, and finiſhed and conſecrated in 1762. It is ſituated on the weſt ſide of Marlborough-ſtreet, oppoſite Glouceſter-ſtreet, to which it forms an elegant termination. The other churches in this city are; on the north ſide of the river, Mary's, Michan's, and Paul's; on the ſouth ſide, James's, Luke's, Kevin's, Peter's, Bride's, Nicholas within, Audeon's, Michael's, Mark's, Anne's, John's, and Andrew's; this laſt is called alſo the *Round church,* from its form being exactly circular: moſt, if not all the others were built in an early age: many, however, have been ſince re-edified, and aſſumed a more modern form: ſome of theſe are not totally devoid of elegance, particularly Anne's. St John's in Fiſhamble-ſtreet was rebuilt in 1773, and has now a handſome front of hewn ſtone decorated with columns ſupporting a pediment. Beſides theſe churches, Dublin is adorned with ſeveral other public buildings; the moſt remarkable of which are the following: The caſtle, the reſidence of the chief governor, built in 1213 by Henry de Londres, was formerly moated and flanked with towers; but the ditch has been long ſince filled up, and the old buildings raſed, the chapel and wardrobe tower excepted, which ſtill remain: Birmingham tower was rebuilt in 1777, and is now called *Harcourt tower.* The caſtle at preſent conſiſts of two courts, the principal of which is an oblong ſquare formed by four ranges of building: within a few years, in the middle of the ſouth range, a handſome edifice called *Bedford tower* has been erected; the front is decorated with a ſmall arcade of three arches, over which is a colonade ſupporting a pediment, from whence riſes an octagon ſteeple crowned with a ſmall cupola and gilt ball in a light pleaſing ſtyle. This tower, which fronts the entrance to the viceroy's apartments, is connected with the buildings on each ſide by two fine gates; over that on the right hand is a ſtatue of Fortitude; and over the left gate, which is the grand portal to the upper court, is the ſtatue of Juſtice. In the lower court are the treaſury and other offices, with military ſtores, an arſenal and armory for 40,000 men, and a barrack in which a captain's detachment of infantry are ſtationed. Between this barrack and the arſenal is the caſtle garden; oppoſite to which, at the rere of the lord Lieutenat's apartments, is a range of building called the *Garden-front,* erected about the year 1740, finiſhed in mountain ſtone, ornamented by ſemicolumn of the Ionic order, and the windows embelliſhed with cornices and architraves, in a fine taſte. The ball-room is now titled St *Patrick's Hall.* The viceroy's body guard conſiſts of a captain, two ſubalterns, and ſixty private men, with a ſubaltern's guard of horſe. The parliament houſe, a moſt ſuperb ſtructure, is ſituated on the north ſide of college-green: it was begun in 1729, finiſhed in 10 years, and coſt 40,000 l. it is built with Portland ſtone, and the front formed by a grand portico of Ionic columns in the moſt finiſhed ſtyle of architectural elegance: the internal parts (which have been lately much improved, under the auſpices of the preſent ſpeaker the right honourable John Forſter) correſpond with its outward magnificence; and the manner in which the inſide is lighted is univerſally admired. The houſe of commons is an octagon, covered with a dome ſupported by columns of the Ionic order, that riſe from an amphitheatrical gallery balluſtraded with iron ſcroll-work: this room is admirably well adapted to its purpoſe. The houſe of lords is an oblong room, ſpacious and lofty, and ornamented in a ſuperb manner: it is alſo judiciouſly adapted for the reception of the auguſt aſſembly which meet there: among other decorations are two pieces of tapeſtry, repreſenting the battle of the Boyne and ſiege of Derry, allowed to have much merit. By order of both houſes of parliament, a grand new front has been lately erected on the eaſt ſide of this magnificent pile; and preparations are making to front the north and weſt ſides in a ſimilar manner, from a deſign of Mr Gandon's: thus inſulated, the whole will form a ſuit of ſenatorial apartments matchleſs in elegance and convenience.

The College founded by queen Elizabeth in 1591 is ſituated at the eaſt end of College-green. It is a moſt beautiful ſtructure, conſiſting of two ſpacious ſquares, the firſt of which contains the refectory, the old hall and chapel, and the new theatre for lectures and examinations; the front of this laſt building is finely decorated with Corinthian columns ſupporting a pediment; and over the front of the old hall, on the eaſt ſide of this ſquare, a handſome ſteeple riſes crowned with a cupola. In the other ſquare, which conſiſts partly of brick buildings for the ſtudents, there is a ſuperb library, extending through its whole length on the ſouth ſide: behind this ſquare there is a fine park. The weſt ſide of the firſt ſquare, which is built with Portland ſtone, forms the grand front, upward of 300 feet in length, ornamented with Corinthian pillars and other decorations in a very fine taſte. At a ſmall diſtance to the ſouth ſide of this front is an elegant edifice in which the provoſt reſides. The printing-office is a neat handſome ſtructure on the north ſide of the park; and oppoſite to it is the anatomy houſe, in which are to be ſeen the celebrated wax models of the human figure, executed at Paris by M. Douane, purchaſed by the right honourable the earl of Shelburne, and preſented to this univerſity. The college of Dublin is an univerſity in itſelf, conſiſting of a provoſt, vice-provoſt, 7 ſenior and 15 junior fellows, and 17 ſcholars of the houſe; the number of ſtudents is generally about 400: it has alſo profeſſors in divinity, common and civil law, phyſic, Greek, modern languages, mathematics, oriental tongues, hiſtory and oratory, modern hiſtory, natural philoſophy, anatomy and ſurgery, chemiſtry, and botany. His royal highneſs the duke of Glouceſter is chancellor, and his grace the lord primate of Ireland vice-chancellor: the viſitors are the chancellor (or, in his abſence, the vice-chancellor) and the archbiſhop of Dublin.

The Royal Exchange, ſituated on Cork-hill, was begun in 1769, and opened for buſineſs in 1779; the expence, amounting to L.40,000, being defrayed by lottery ſchemes, conducted by the merchants of Dublin with an integrity that did them honour. The building is nearly a ſquare, having three fronts of Portland ſtone in the Corinthian order, and crowned in the midſt with a fine dome, which is ſupported on the inſide by 12 Compoſite fluted pillars that form a circular walk in the centre of the ambulatory: above theſe pillars are 12 circular windows, and the cieling of the dome, which is ornamented with ſtucco, in the Moſaic ſtyle, has alſo a large window in the middle that illumines moſt of the building. Oppoſite the north entrance, in the circular walk, is a ſtatue of his preſent majeſty George III. in a Roman military habit; it is executed in bronze by Van Noſt, and elevated on a white marble pedeſtal: in a niche on the ſtair-caſe leading to the coffee-room is a white marble ſtatue of the late Dr Charles Lucas, executed by Smyth. The north front, which commands a fine view of Parliament-ſtreet and Eſſex-bridge, is embelliſhed by a range of ſix columns and their correſpondent pilaſters, ſupporting a grand pediment with a baluſtrade on each ſide: a flight of ſtone ſteps leads from the ſtreet to the entrance, which is by three fine iron-railed gates: the weſt front varies but little from the north, except in the want of a pediment, and having only three ſteps aſcending to the entrance, the ground on that ſide being nearly on a level; this front is oppoſite the eaſt end of Caſtle-ſtreet near the principal entrance to the Caſtle.

The Hoſpital for Lying-in-Women, founded by Dr Bartholomew Moſſe, and opened in 1757, ſtands on the north ſide of Great Britain ſtreet. The building is extremely light and elegant; a beautiful ſteeple riſes in the centre, and the wings are formed by ſemicircular colonnades on each ſide. Adjoining the eaſt colonnade is the Rotunda, where balls and aſſemblies are held, and concerts performed, for the benefit of the charity: cloſe to it are now erecting the grand ſuit of apartments before mentioned. The garden at the rere of the hoſpital is laid out in a good taſte.

The Blue-coat Hoſpital was founded on the weſt ſide of Queen-ſtreet by Charles II. in 1670, for educating the children of reduced freemen of the city: but the original building being greatly decayed, was taken down, and the new Blue-coat Hoſpital, ſituated in Oxmantown-green, was begun in 1773. The front is enriched by four Ionic columns, ſupporting a pediment in the centre, over which the ſteeple riſes, embelliſhed with Corinthian and Compoſite columns in an admired taſte. Connected with the front by circular walls ornamented with balluſtrades and niches, are the ſchool on one ſide and the church on the other: theſe form two well proportioned wings; they are of a ſimilar conſtruction; and each is crowned with a ſmall ſteeple or turret, correſponding with the reſt in uniform harmony and beauty.

The Barracks, the foundation of which was laid in 1704, are eſteemed the largeſt and moſt commodious in Europe. They conſiſt of four ſquares, ſituated at the weſt end of the town, on the north ſide of the river. The royal ſquare in the centre, with the horſe barrack and the little ſquare on each ſide, form a ſpacious and extenſive front to the ſouth: the palatine, now called the new ſquare, is oppoſite to Oxmantown-green; it has been lately rebuilt with hewn ſtone in a very elegant manner.

The Royal Hoſpital at Kilmainham for the ſupport of invalids of the Iriſh army was founded by king Charles II. on a plan ſimilar to that of Chelſea in England. The building was completed in 1683, and coſt upwards of L.23,500. It is ſituated at the weſt end of the town on a riſing ground near the ſouth ſide of the river, from whence there is an eaſy aſcent to it through ſeveral rows of tall trees. This edifice is of a quadrangular form, incloſing a ſpacious area handſomely laid out in graſs-plots and gravelled walks: an arcade is carried along the lower ſtory in each ſquare to the entrance of the hall and chapel, which are both curiouſly decorated; in the former are ſeveral whole-length portraits of royal perſonages and other diſtinguiſhed characters.

Dr Stevens's Hoſpital, the foundation of which was laid in 1720, is a neat quadrangular building, pleaſantly ſituated on the banks of the river near the weſt end of James's ſtreet, from whence a gravelled walk leads by a gentle deſcent to the entrance of the hoſpital, and is continued from thence to the water's edge.

The Linen-hall, at the north end of Linen-hall ſtreet, which was opened at the public expence in 1728 for the reception of linen cloths brought to the Dublin market, is a handſome building, lately enlarged with treble its number of former rooms, which furniſh a new proof of commercial proſperity.

The New Priſon in Green-ſtreet, the firſt ſtone of which was laid in 1773, is a large quadrangular ſtructure, deſigned and executed under the direction of the late Mr Cooley. The eaſt front conſiſts of a centre break of mountain ſtone ruſticated and crowned by a pediment, with a plain facade of black limeſtone on each ſide; and at the external angles of the building are four round towers.

There are many other public edifices in this city and its environs which merit particular notice. The Hoſpital for Lunatics in weſt Bow-lane, founded by Dean Swift, and opened in 1757; the Hibernian School in the Phœnix Park, and the Marine School on Sir John Rogerſon's Quay, the firſt for educating the poor children of ſoldiers, and the other for bringing up to the ſea ſervice the ſons of deceaſed or diſabled ſeamen; the Hoſpital for Incurables in ſouth Townſend-ſtreet; Mercer's Hoſpital in Stephen-ſtreet; the Meath Hoſpital on the Coombe; and Simpſon's Hoſpital in Great Britain ſtreet, the laſt of which was eſtabliſhed for the reception of blind and gouty men; are all handſome edifices conſtructed of hewn ſtone in the modern ſtyle.

To theſe public buildings may be added St Nicholas's Hoſpital in Francis-ſtreet; the Infirmary for ſick and wounded ſoldiers of the army, and the Foundling Hoſpital in James's-ſtreet; the Magdalen Aſylum in Leeſon-ſtreet; and the Houſe of Induſtry in Channel-row; the halls for corporations (particularly the Weavers Hall on the Coombe, over the entrance of which is a ſtatue of his late majeſty George II.); the Tholſel; the old Four Courts; the old Cuſtomhouſe; and ſeveral others. The Charitable Infirmary, which was firſt opened in 1728 and rebuilt in 1741, ſtood on the Inn's Quay, but has lately been pulled down, together with moſt of the houſes on that quay, where the new courts of juſtice are to be erected: and the benefits of this humane inſtitution are now diſpenſed to the public at a houſe taken for that purpoſe in Jervis-ſtreet. The new courts of juſtce, which will be a principal ornament to the metropolis, are from a deſign of Mr Gandon's, as is alſo the new Cuſtomhouſe, now nearly finiſhed on the north wall. This front extends 375 feet, enriched with arcades and columns of the Doric order, crowned with an entablature: the centre has a portico finiſhed with a pediment, in which is a basrelief of emblematical figures alluding to commerce: over the pediment is an attic ſtory; and a magnificent dome finiſhes the centre, whereon is a pedeſtal ſupporting a ſtatue of Commerce: the key-ſtones over the entrances and in the centre of the pavilions are decorated with emblematical heads repreſenting the produce of the principal rivers of Ireland: the ſouth or front to the river, with the arms of Ireland over each pavilion, is of Portland ſtone: the whole, being formed of large and ſtriking parts, adds much to the pictureſque ſcene of the river, and will remain a laſting monument of reputation to the ſeveral artiſts employed in this ſuperb building.

The playhouſes, conſidered as public buildings, have nothing to recommend them to notice. One only, viz. the old houſe, now the theatre-royal, in Smock-alley, is kept open by Mr Daly; who, in conſequence of the bill paſſed laſt ſeſſion of parliament for the regulation of the ſtage, enjoys the excluſive privilege of managing and directing the theatrical exhibitions in this metropolis. The playhouſe in Crow-ſtreet, which formerly poſſeſſed the diſtinction of theatre-royal, has been ſhut up theſe ſeveral years paſt.

But a minute deſcription of every public edifice would occupy more room than this publication admits, not to mention the ſeveral private houſes, juſtly admired for their elegance. Among theſe are:

Leinſter-houſe, the town reſidence of his grace the Duke of Leinſter. The entrance to this princely manſion is from Kildare-ſtreet, through a grand gateway of ruſtic ſtone work, into a ſpacious court which forms a ſegment of a circle before the principal front. The inſide of this magnificent ſtructure is equal to its exterior appearance; the hall lofty and noble; and the apartments decorated and furniſhed in a ſplendid taſte, and enriched with ſeveral very valuable paintings. The garden front, plain yet bold, poſſeſſes a pleaſing ſimplicity; the garden is ſpacious and elegant, with a beautiful lawn in the centre. The whole of this building is inferior to few private edifices in the Britiſh dominions.

The Earl of Charlemont's houſe is finely ſituated in the middle of Palace-row, on an eminence exactly fronting the centre of the garden at the rere of the Lying-in-Hoſpital. The front is built with hewn ſtone brought from Arklow, ſuperior to that of Portland. The inſide of this houſe is ſuperb and convenient: the hall cieling is ſupported by columns; ſome of the apartments are decorated with a ſelect but choice collection of paintings of the beſt maſters; among which are one of Rembrandt's fineſt pictures, repreſenting Judas repenting and caſting the ſilver pieces on the ground; a portrait of Cæſar Borgia, by Titian; and the Lady's Laſt Stake by Hogarth, &c. &c. The library is eſteemed one of the fineſt apartments in Dublin, and contains a very valuable collection of the beſt authors. At one end of it is an anti-chamber, with a fine ſtatue in white marble of the Venus de Medicis by Wilton; and at the other end are two ſmall rooms, one a cabinet of pictures and antiquities, the other of medals: it is ſituated at the rere of the houſe, and connected with it by a corridore, in which are ſome handſome ſtatues and Egyptian curioſities.

Dublin, which is the ſeat of government and of the chief courts of juſtice, has received many charters and ample privileges from the kings of England ſince the reign of Henry II. who introduced the Engliſh laws into this kingdom. Richard II. erected it into a marquiſate in favour of Robert de Vere Earl of Oxford, whom he alſo created Duke of Ireland. It is an archiepiſcopal ſee, and returns with the univerſity and the county ſix members to parliament. The civil government of Dublin is executed by a lord-mayor, recorder, two ſheriffs, twenty-four aldermen, and a common council formed of repreſentatives from the twenty-five corporations. Every third year the lord-mayor, in conformity with an old charter, perambulates the bounds of the city and its liberties; and formerly the freemen of the ſeveral corporations, armed and mounted on horſeback, were accuſtomed to attend the chief magiſtrate on this occaſion, which was titled riding the franchiſes: but as this cuſtom was productive of idleneſs, intoxication, and riots, among the lower orders of the people, it has been of late years very properly laid aſide. Beſides the ſilk, woollen, and worſted manufactures carried on in that quarter of the ſuburbs called the Earl of Meath's Liberty, and which have been conſiderably improved within theſe few years, other branches of uſeful manufacture are eſtabliſhing in different parts of the metropolis; and though the trade of Dublin has heretofore conſiſted chiefly in the importation of foreign commodities, yet, now that the reſtrictions on their woollens and moſt of their other goods are removed, it is hoped the daily enlargement of their export trade will cauſe a proportionable increaſe of national opulence.

Dublin would have had a commodious ſtation for ſhipping, were it not that the harbour is choaked up with two banks of ſand, called the *North and South Bulls*, which prevent veſſels of large burden from coming over the bar. This, however, is in ſome meaſure remedied by a prodigious work of ſtone, and piles of wood extending ſome miles into the bay on the ſouth ſide, at the end of which there is a light-houſe, beautifully conſtructed, after a deſign of the late Mr Smith's. But the port of Dublin is capable of much greater improvement; particularly by turning the courſe of the river Dodder, building a mole from the north-wall to Ringſend, and clearing the harbour, ſo as to form a grand baſon on the ſouth ſide for the reception of veſſels of all burthens. This work is to be immediately carried into execution, and will no doubt meet every poſſible encouragement, from that ſpirit for promoting the national welfare which now prevails throughout this kingdom, and is remarkably conſpicuous in the capital, where, among others, are the following public inſtitutions.

The board of truſtees for promoting the linen and hempen manufactures, eſtabliſhed by act of parliament. The Dublin ſociety, incorporated by charter in the year 1749, for improving huſbandry and other uſeful arts. The royal college of phyſicians, eſtabliſhed in the year 1679 for promoting of medical knowledge. The royal college of ſurgeons, inſtituted in the year 1785. The royal Iriſh academy, for the advancement of ſcience, polite literature, and antiquities, incorporated by letters patent the 28th of January 1786: His majeſty is patron, and the chief governor for the time being is viſitor. The Hibernian ſociety, for maintaining, educating, and apprenticing, the orphans and children of ſoldiers in Ireland. The Hibernian marine ſociety, for maintaining, educating, and apprenticing, the orphans and children of decayed ſeamen in his majeſty's navy and the merchants ſervice, alſo incorporated by royal charter.

But among theſe public inſtitutions, that of the bank of Ireland muſt not be omitted: it was eſtabliſhed by act of parliament in 1783; and by facilitating the circulation of ſpecie, gives life and vigour to manufactures and commerce. It is conducted under the management of a governor, deputy-governor, and fifteen directors choſen annually from among the ſubſcribers; with this reſtriction, that five new directors at leaſt muſt be choſen every year. This bank is kept in Mary's-abbey. There are four other banks in this city under the following firms, *viz.* Right Honourable David La Touche and Co. and Sir William Gleadowe Newcomen, Bart. and Co. both in Caſtle-ſtreet; John Dawſon Coates, Eſq; Thomas-ſtreet; and John Finlay and Co. upper Ormond-quay. The houſes in which the firſt three are kept are ſtructures worthy of notice, particularly that of Sir William Gleadowe Newcomen's, which has been rebuilt with hewn ſtone, in a good taſte, after a deſign of the late Mr Ivory's.

To theſe public inſtitutions may be added the General Poſt-Office of Ireland, eſtabliſhed by act of parliament in 1784, previous to which time the poſt-office of this kingdom was only conſidered a branch of the Engliſh one. The building erected for this purpoſe is on the ſouth ſide of College-green: it is a fine lofty extenſive ſtructure, and the offices for clerks, &c. are extremely well adapted. There are two poſt-maſters general, a ſecretary, treaſurer, accountant-general, reſident ſurveyor, and comptroller. There is alſo a penny-poſt under the direction of the ſame officers, eſtabliſhed for the conveyance of letters to all parts throughout the city and its environs.

Dublin is remarkably well ſupplied with fleſh, fowl, and fiſh, the latter in much greater perfection than any other capital in Europe. It is ſupplied with coals chiefly from Cumberland and Scotland; and water is conveyed to the city on the north ſide from the river Liffey, by machines curiouſly conſtructed for the purpoſe, at an outlet called *Iſland-bridge*: the ſouth ſide is ſupplied with that neceſſary article from a fine reſervoir or baſon, ſurrounded with a wall and a handſome graſs walk encloſed on each ſide by a thick-ſet hedge and trees planted at equal diſtances. From one end of it there is a view of the canal for the convenience of inland water carriage, now completed as far as Monaſtereven, between which and the canal harbour in James's-ſtreet, paſſage-boats ply daily; they are well appointed and accommodated with all neceſſary refreſhments. At a ſmall diſtance from the baſon there is a bridge of a ſingle arch thrown over the canal, the elegance and architecture of which are much admired: the ſides of the canal for ſome miles into the country are planted with elm-trees, which renders its banks in fair weather a delightful place of exerciſe for the citizens; who alſo reſort for recreation to his majeſty's Phœnix-park, a fine extenſive encloſure at the weſt end of the town and on the oppoſite ſide of the river to the canal, diverſified with woodland, campaign, and riſing ground, and well ſtocked with deer. It is ſeven miles in circuit; and beſides the Hibernian ſchool, is adorned with the viceroy's beautiful villa and ſome handſome lodges belonging to the rangers: in this park are alſo a magazine for powder and a battery that commands the city. In 1747, a fluted pillar 30 feet high, with a phœnix on the top, was erected in the centre of a ring in this park by the celebrated earl of Cheſterfield when lord lieutenant of Ireland.

The circular road which ſurrounds the city, beginning on one ſide of the river, at the eaſt end of the town, and terminating on the oppoſite ſhore, is carried through the park. This road forms a very agreeable ride, and is much frequented. It is the boundary of the juriſdiction of the new police, inſtituted for the better preſervation of the peace and good order of the city and the perſonal ſecurity of its inhabitants. This inſtitution, lately eſtabliſhed by act of parliament, is under the direction of a chief commiſſioner, three aſſiſtant commiſſioners, and four diviſional juſtices, who are all aldermen of the city: which is therefore properly termed *the diſtrict of the metropolis*, and divided into four wards. The police-guard conſiſts of 40 horſemen and 400 foot, well armed, and in regular uniform: they are taught military diſcipline, and ſtationed at night-time in the ſeveral watch-houſes; from whence parties are conſtantly patrolling the ſtreets, and centinels are placed at different ſtands. This inſtitution is found by experience to be a much more effectual prevention of robberies, riots, and nocturnal outrages, than the pariſh watches; and to this ſecurity which the well diſpoſed working manufacturers enjoy, may in a great meaſure be attributed that encreaſing ſpirit of induſtry and peaceable behaviour now ſo prevalent among this uſeful claſs of the community, which cannot fail to be productive of the moſt ſalutary conſequences to the future welfare of the metropolis and the kingdom in general.

DUBOS (John Baptiſt), a learned and ingenious French author, born at Beauvais in 1670. He finiſhed his ſtudies at Paris, and at length was intruſted with the management of ſeveral important affairs in Italy, England, and Holland. At his return to Paris, he had a prebendary given him; afterwards he had a penſion of two thouſand livres, and the abbey of Notre Dame at Reſſons, near Beauvais. He died at Paris, when perpetual ſecretary of the French academy, on the 23d of March 1742. His principal works are, 1. Critical Reflections on Poetry and Painting, in three volumes duodecimo. 2. A Critical Hiſtory of the French Monarchy in Gaul, two volumes 4to.

DUBRIS (anc. geog.), a town of Britain; now *Dover*, from the *Dovoria* of the lower age. A port town of Kent, oppoſite to Calais.

DUCAL, in general, ſomething belonging to a duke. See Duke.

The letters patent granted by the ſenate of Venice are called *ducals:* ſo alſo are the letters wrote, in the name of the ſenate, to foreign princes. The denomination of ducal is derived hence; that, at the beginning of ſuch patents, the name of the duke or doge is wrote in capitals, thus, *N—Dei Gratia Dux Venetiarum*, &c. The date of ducals is uſually in Latin, but the body is in Italian. A courier was diſpatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716), againſt the Turks, with the republic of Venice.

DUCAS, a learned Greek, who wrote an hiſtory of what paſſed under the laſt emperors of Conſtantinople, till the ruin of that city. This work, which is eſteemed, was printed at the Louvre in 1649, with the Latin tranſlation and notes of Bouillaud.

DUCAT, a foreign coin, either of gold or ſilver, ſtruck in the dominions of a duke; being about the ſame value with a Spaniſh piece of eight, or a French crown, or four ſhillings and ſixpence ſterling when of ſilver; and twice as much when of gold. See Coin.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting againſt the emperor Juſtin the Younger, made himſelf duke of Ravenna, and called himſelf *Exarcha*, i. e. *without lord or ruler;* and, to ſhow his independence, ſtruck pieces of money of very pure gold in his own name, and with his own ſtamp, which were called *ducati, ducats;* as Procopius relates the ſtory.

After him, the firſt who ſtruck ducats were the Venetians, who called them *Zecchini* or *ſequins*, from Zecca, the place where they firſt were ſtruck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger king of Sicily had coined ducats as early as 1240. And Du Cange ſcruples not to affirm, that the firſt ducats were ſtruck in the duchy of Apulia in Calabria. The chief gold ducats now current are, the ſingle and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heavieſt of them weighs 5 pennyweights 17 grains, and the lighteſt 5 pennyweights 10 grains; which is to be underſtood of the double ducats, and of the ſingle in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make uſe of the ſilver one; which, with them, is no real ſpecies, but only a money of account like our pound. It is equivalent to 11 rials. See Rial. The ſilver ducats of Florence ſerve there for crowns.

DUCATOON, a ſilver coin, ſtruck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are alſo Dutch and Flemiſh ducatoons. They are all nearly on the ſame footing; and being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four ſhillings and eightpence ſterling.

There is alſo a gold ducatoon, ſtruck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one ſhilling and eleven pence halfpenny the florin.

DUCENARIUS, in antiquity, an officer in the Roman army, who had the command of 2000 men.

The emperors had alſo ducenarii among their procurators or intendants, called *procuratores ducenarii*. Some ſay, that theſe were ſuch whoſe ſalary was two hundred ſeſterces; as in the games of the circus, horſes hired for two hundred ſeſterces were called *ducenarii*. Others hold, that ducenarii were thoſe who levied the two hundredth penny, the officers appointed to inſpect the raiſing of that tribute. In the inſcription at Palmyra, the word *ducenarius*, in Greek δυκηναριος, occurs very often.

DUCENTESIMA, in antiquity, a tax of the two hundredth penny, exacted by the Romans.

DUCHAL (James), D. D. a late pious and learned diſſenting miniſter, was born in Ireland, and finiſhed his ſtudies at the univerſity of Glaſgow; which afterwards, from a regard to his merit, conferred on him the degree of doctor of divinity. He reſided 10 or 11 years at Cambridge, as the paſtor of a ſmall congregation there; where he enjoyed his beloved retirement, the advantage of books and of learned converſation, which he improved with the greateſt diligence. On Mr Abernethy's removal from Antrim, he ſucceeded him there; and on that gentleman's death, he ſucceeded him as miniſter of the diſſenting meeting-houſe in Wood-ſtreet, Dublin. In this ſituation he continued till his death, which happened on the 4th of May 1761, when he had completed his 64th year. He publiſhed a volume of excellent diſcourſes on the preſumptive arguments in favour of the Chriſtian religion, and many occaſional tracts; and after his death were publiſhed a number of his ſermons, in three volumes 8vo.

DUCHY, in geography, an appellation given to the dominions of a duke.

Duchy Court, a court wherein all matters belonging to the duchy or county palatine of Lancaſter are decided by decree of the chancellor of that court.

The origin of this court was in Henry the IV.'s time, who obtained the crown by depoſition of Richard II. and having the duchy of Lancaſter, by deſcent, in right of his mother, became ſeiſed thereof as king, not as duke: So that all the liberties, franchiſes, and juriſdictions of the ſaid county paſſed from the king, by his great ſeal, and not by livery or attornment, as the earldom of March, and other poſſeſſions, which deſcended to him by other anceſtors than the king's did. Henry IV. by authority of parliament, ſevered the poſſeſſions, liberties, &c. of the ſaid duchy from the crown: but Edward IV. reſtored them to their former nature.

The officers belonging to this court are, a chancellor, attorney-general, receiver-general, clerk of the court, and meſſenger; beſide the aſſiſtants, as an attorney in the exchequer, another in chancery, and four councellors.

DUCK, in ornithology. See ANAS and DECOY.

This fowl is furniſhed with a peculiar ſtructure of veſſels about the heart, which enables it to live a conſiderable time under water, as is neceſſary for it in diving. This made Mr Boyle think it a more proper ſubject for experiments with the air-pump than any other bird. A full grown duck being put into the receiver of an air-pump, of which ſhe filled one third part, and the air exhauſted, the creature ſeemed to bear it better for the firſt moments that a hen or other ſuch fowl; but, after about a minute, ſhe ſhowed great ſigns of uneaſineſs, and in leſs than two minutes her head fell down, and ſhe appeared dying, till revived by the letting in of the air. Thus, whatever facility of diving this and other water-fowl may have, it does not appear that they can ſubſiſt, without air for reſpiration, any longer than other animals. A young callow duck was afterwards tried in the ſame manner, and with the ſame ſucceſs, being reduced very near death in leſs than two minutes. But it is obſervable, that both birds ſwelled very much on pumping out the air, ſo that they appeared greatly larger to the ſpectators, eſpecially about the crop; it not being intended that any water-fowl ſhould live in an exceedingly rarefied air, but only be able to continue occaſionally ſome time under water. Nature, though ſhe has provided them with the means of this, has done nothing for them in regard to the other.

The ſtrongeſt inſtance of theſe creatures being calculated to live almoſt in any ſituation, we have in the accounts of the blind ducks in the Zirchnitzer lake in Carniola. It is ſuppoſed that this lake communicates with another lake under ground in the mountain Savornic, and fills or empties itſelf according to the fulneſs or emptineſs of that lake; the water of the upper lake running off, and that in vaſt quantities, by holes in the bottom. The ducks, which are here always in great numbers, are often carried down along with the water, and forced into the ſubterraneous lake to which it retires. In this unnatural habitation, many of theſe creatures undoubtedly periſh, but ſome remain alive. Theſe become blind, and loſe all their feathers; and in the next filling of the lake, both they and vaſt numbers of fiſh are thrown up with the water. At this time they are fat, but make a ſtrange appearance in their naked ſtate, and are eaſily caught, by reaſon of their want of ſight. In about a fortnight they recover their ſight and feathers; and are then of the ſize of a common wild-duck, but of a black colour, with a white ſpot in their forehead. When opened, on being taken at their firſt coming up in their blind ſtate, their ſtomachs are found full of ſmall fiſhes, and ſomewhat reſembling weeds. From this it ſeems, that they cannot be abſolutely blind; but that the degree of light to which they have been accuſtomed in their ſubterraneous habitation, was ſufficient to enable them to procure food for themſelves; and their blindneſs, on coming again into open day-light, is no other than that of a man who has been long in the dark, on having in an inſtant a large blaze of candles ſet under his eyes.

DUCK (Stephen), originally a threſher in a barn, was born about the beginning of the preſent century. By his poetical talents he firſt attracted the notice of ſome gentlemen at Oxford; and being recommended to Queen Caroline, he, under her patronage, took orders, and was preferred to the living of Byfleet in Surry. His abilities were, however, much more conſpicuous in his primitive ſtation than in his advancement; though, it is ſaid, he was not diſliked as a preacher. Falling at length into a low-ſpirited melancholy way, probably owing to his change of life and ceſſation from his uſual labour, he in a fit of lunacy flung himſelf into the Thames, in 1756.

DUCKING, plunging in water, a diverſion anciently practiſed among the Goths by way of exerciſe; but among the Celtæ, Franks, and ancient Germans, it was a ſort of puniſhment for perſons of ſcandalous lives.—At Marſeilles and Bourbon their men and women of ſcandalous life are condemned to the cale, as they call it; that is, to be ſhut up naked to the ſhift in an iron cage faſtened to the yard of a ſhallop, and ducked ſeveral times in the river. The ſame is done at Thoulouſe to blaſphemers.

DUCKING, a ſort of marine puniſhment, inflicted by the French, on thoſe who have been convicted of deſertion, blaſphemy, or exciting ſedition. It is performed as follows: The criminal is placed aſtride of a ſhort thick batten, faſtened to the end of a rope, which paſſes through a block hanging at one of the yard-arms. Thus fixed, he is hoiſted ſuddenly up to the yard, and the rope being ſlackened at once, he is plunged into the ſea. This chaſtiſement is repeated ſeveral times conformable to the purport of the ſentence pronounced againſt the culprit, who has at that time ſeveral cannon-ſhot faſtened to his feet during the puniſhment;

which is rendered public by the firing of a gun, to advertiſe the other ſhips of the fleet thereof, that their crews may become ſpectators.

Ducking is alſo a penalty which veteran ſailors pretend to inflict on thoſe who, for the firſt time, paſs the tropic of Cancer, the equator, or the ſtraits of Gibraltar, in conſequence of their refuſal or incapacity to pay the uſual fine levied on this occaſion.

Ducking-Stool. See Castigatory.

DUCKUP, at ſea, is a term uſed by the ſteer'ſman, when the main-ſail, fore-ſail, or ſprit-ſail, hinders his ſeeing to ſteer by a land-mark: upon which he calls out, *Duckup the clew-lines of theſe ſails;* that is, hale the ſails out of the way. Alſo when a ſhot is made by a chace-piece, if the clew of the ſprit-ſail hinders the ſight, they call out, *Duckup,* &c.

DUCT, in general, denotes any tube or canal. It is a term much uſed by anatomiſts.

DUCTILITY, in phyſics, a property poſſeſſed by certain ſolid bodies, which conſiſts in their yielding to percuſſion or preſſure, and in receiving different forms without breaking.

Some bodies are ductile both when they are hot and when they are cold, and in all circumſtances. Such are metals, particularly gold and ſilver. Other bodies are ductile only when heated to a ſufficient degree; ſuch as wax and other ſubſtances of that kind, and glaſs. Other bodies, particularly ſome kinds of iron, called by the workmen *red-ſhort,* braſs, and ſome other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requiſite to produce ductility in bodies of the firſt kind, vary according to their different natures. In general, the heat of the body muſt be ſuch as is ſufficient to reduce it to a middle ſtate betwixt ſolidity and perfect fuſion. As wax, for inſtance, is fuſible with a very ſmall heat, it may be rendered ductile by a ſtill ſmaller one; and glaſs, which requires a moſt violent heat for its perfect fuſion, cannot acquire its greateſt ductility until it is made perfectly red-hot, and almoſt ready to fuſe. Laſtly, ſome bodies are made ductile by the abſorption of a fluid. Such are certain earths, particularly clay. When theſe earths have abſorbed a ſufficient quantity of water to bring them into a middle ſtate betwixt ſolidity and fluidity, that is to the conſiſtence of a conſiderably firm paſte, they have then acquired their greateſt ductility. Water has preciſely the ſame effect upon them in this reſpect that fire has upon the bodies above mentioned.

DUDLEY (Edmund), an eminent lawyer and able ſtateſman in the reign of Henry VII.; who with Sir Richard Empſon, another lawyer of the ſame complexion, aſſiſted in filling that rapacious monarch's coffers by arbitrary proſecutions of the people on old penal ſtatutes. They were beheaded on the acceſſion of Henry VIII. to pacify the clamours of the people for juſtice.

Dudley (John), duke of Northumberland, ſon of the above, a ſtateſman; memorable in the Engliſh hiſtory for his unſucceſsful attempt to place the crown on the head of his daughter-in-law, lady Jane Grey, who fell a victim to his ambition; was born in 1502, and beheaded in 1553. See *(Hiſtory of)* England. Ambroſe his eldeſt ſon was a brave general and able ſtateſman under queen Elizabeth; and received the appellation of *the good earl of Warwick.* Henry, the duke's ſecond ſon, was killed at the ſiege of St Quintin. Robert, the third ſon, a man of bad character, was created earl of Leiceſter; and was one of queen Elizabeth's favourites. His fourth ſon was the unfortunate lord Guildford Dudley, whoſe only crime was his being the huſband of lady Jane Grey, for which he was beheaded in 1554.

Dudley (Sir Robert), as he was called in England, and, as he was ſtyled abroad, *earl of Warwick and duke of Northumberland,* was the ſon of Robert above mentioned, by the lady Douglas Sheffield; and was born at Sheen in Surry in 1573, where he was carefully concealed, to prevent the queen's knowledge of the earl's engagements with his mother. He ſtudied at Oxford; when his father dying, left him the bulk of his eſtate. He was at this time one of the fineſt gentlemen in England; and having a particular turn to navigation, fitted out a ſmall ſquadron at his own expence, with which he ſailed to the river Oroonoque, and took and deſtroyed nine ſail of Spaniſh ſhips. In 1595, he attended the earl of Eſſex, and the lord high admiral of England, in their expedition againſt the Spaniards; when, for his gallant behaviour at the taking of Cadiz, he received the honour of knighthood. He now endeavoured to prove the legitimacy of his birth, in order to be intitled to his hereditary honours. But being overpowered by the intereſt of the counteſs dowager of Leiceſter, he applied for a licence to travel; and being well received at the court of Florence, reſolved to continue there, notwithſtanding his receiving a letter of recal; on which his whole eſtate was ſeized by king James I. and veſted in the crown. He diſcovered at the court of Coſmo II. great duke of Tuſcany, thoſe great abilities for which he had been admired in England, and was at length made chamberlain to his ſerene highneſs's conſort. He there contrived ſeveral methods of improving ſhipping; introduced new manufactures; and by other ſervices obtained ſo high a reputation, that at the deſire of the archducheſs, the emperor Ferdinand, in 1620, created him a duke of the holy Roman empire. He afterwards drained a vaſt tract of moraſs between Piſa and the ſea; and raiſed Leghorn, which was then a mean, pitiful place, into a large and beautiful town, improving the haven by a mole, which rendered it both ſafe and commodious; and having engaged his highneſs to declare it a free port, he, by his influence and correſpondence, drew many Engliſh merchants to ſettle and ſet up houſes there, which was of very great ſervice to his native country, as well as to the Spaniards. He was alſo the patron of learned men, and held a high place himſelf in the republic of letters. His moſt celebrated work is his *Del Arcano del Mare,* in two volumes, folio.

DUEL, a ſingle combat, at a time and place appointed, in conſequence of a challenge. This cuſtom came originally from the northern nations, among whom it was uſual to decide all their controverſies by arms. Both the accuſer and accuſed gave pledges to the judges on their reſpective behalf; and the cuſtom prevailed ſo far amongſt the Germans, Danes, and Franks, that none were excuſed from it but women, ſick people, cripples, and ſuch as were under 21 years of age or above 60. Even eccleſiaſtics, prieſts, and monks, were obliged to find champions to fight in their ſtead. The puniſhment of the vanquiſhed was either death, by hanging or beheading; or, mutilation of members, according to the circumſtances of the caſe. Duels were at firſt admitted not only on criminal occaſions, but on ſome civil ones for the maintenance of rights to eſtates, and the like: in latter times, however, before they were entirely aboliſhed, they were reſtrained to theſe four caſes. 1. That the crime ſhould be capital. 2. That it ſhould be certain the crime was perpetrated. 3. The accuſed muſt by common fame be ſuppoſed guilty. And, 4. The matter not capable of proof by witneſſes.

Duel, at preſent, is uſed for ſingle combat on ſome private quarrel; and muſt be premeditated, otherwiſe it is called a *rencounter*. If a perſon is killed in a duel, both the principals and ſeconds are guilty, whether the ſeconds engage or not. (See the article Murder.) It is alſo a very high offence to challenge a perſon either by word or letter, or to be the meſſenger of a challenge, (See Law, n° clxxxv. 20.)

The general practice of duelling, in this laſt ſenſe, took its riſe in the year 1527, at the breaking up of a treaty between the emperor Charles V. and Francis I. The former deſired Francis's herald to acquaint his ſovereign, that he would henceforth conſider him not only as a baſe violator of public faith, but as a ſtranger to the honour and integrity becoming a gentleman. Francis, too high-ſpirited to bear ſuch an imputation, had recourſe to an uncommon expedient to vindicate his character. He inſtantly ſent back the herald with a cartel of defiance, in which he gave the emperor the lie in form, challenged him to ſingle combat, requiring him to name the time and place of the encounter, and the weapons with which he choſe to fight. Charles, as he was not inferior to his rival in ſpirit or bravery, readily accepted the challenge; but after ſeveral meſſages concerning the arrangement of all the circumſtances relative to the combat, accompanied with mutual reproaches bordering on the moſt indecent ſcurrility, all thoughts of this duel, more becoming the heroes of romance than the two greateſt monarchs of their age, were entirely laid aſide.

The example of two perſonages ſo illuſtrious, drew ſuch general attention, and carried with it ſo much authority, that it had conſiderable influence in introducing an important change in manners all over Europe. Duels, as has already been obſerved, had been long permitted by the laws of all the European nations; and, forming a part of their juriſprudence, were authoriſed by the magiſtrate on many occaſions, as the moſt proper method of terminating queſtions with regard to property, or of deciding in thoſe which regarded crimes. But ſingle combats being conſidered as ſolemn appeals to the omniſcience and juſtice of the Supreme Being, they were allowed only in public cauſes, according to the preſcription of law, and carried on in a judicial form*. Men, accuſtomed to this manner of deciſion in courts of juſtice, were naturally led to apply it to perſonal and private quarrels. Duels, which at firſt could be appointed by the civil judge alone, were fought without the interpoſition of his authority, and in caſes to which the laws did not extend. The tranſaction between Charles and Francis ſtrongly countenanced this practice. Upon every affront or injury which ſeemed to touch his honour, a gentleman thought himſelf intitled to draw his ſword, and to call on his adverſary to make reparation. Such an opinion, introduced among men of fierce courage, of high ſpirit, and of rude manners, where offence was often given, and revenge was always prompt, produced moſt fatal conſequences. Much of the beſt blood in Chriſtendom was ſhed; many uſeful lives were loſt; and, at ſome periods, war itſelf hath hardly been more deſtructive than theſe conteſts of honour. So powerful, however, is the dominion of faſhion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to aboliſh a practice unknown among the ancients, and not juſtifiable by any principle of reaſon; though at the ſame time we muſt aſcribe, in ſome degree, the extraordinary gentleneſs and complaiſance of modern manners, and that reſpectful attention of one man to another, which at preſent render the ſocial intercourſes of life far more agreeable and decent than among the moſt civilized nations of antiquity.

Public opinion is not eaſily controlled by civil inſtitutions; for which reaſon it may be queſtioned whether any regulations can be contrived of ſufficient force to ſuppreſs or change the rule of honour which ſtigmatizes all ſcruples about duelling with the reproach of cowardice.

The inadequate redreſs which the law of the land affords for thoſe injuries which chiefly affect a man in his ſenſibility and reputation, tempts many to redreſs themſelves. Proſecutions for ſuch offences, by the trifling damages that are recovered, ſerve only to make the ſufferer more ridiculous.—This ought to be remedied.

For the army, where the point of honour is cultivated with exquiſite attention and refinement, there might be eſtabliſhed a court of honour, with a power of awarding thoſe ſubmiſſions and acknowledgments which it is generally the object of a challenge to obtain; and it might grow into a faſhion with perſons of rank of all profeſſions to refer their quarrels to the ſame tribunal.

Duelling, as the law now ſtands, can ſeldom be overtaken by legal puniſhment. The challenge, appointment, and other previous circumſtances, which indicate the intention with which the combatants met, being ſuppreſſed, nothing appears to a court of juſtice but the actual rencounter; and if a perſon be ſlain when actually fighting with his adverſary, the law deems his death nothing more than manſlaughter.

DUERO, or Duro, a large river, which, riſing in Old Caſtile in Spain, runs from eaſt to weſt, croſſes the province of Leon, and after dividing Portugal from Spain by a ſoutherly courſe, turns weſtward, croſſes Portugal, and falls into the Atlantic Ocean at Porto-Port.

DUGDALE (Sir William), an eminent Engliſh hiſtorian, antiquarian, and herald, born in Warwickſhire in 1605. He was introduced into the herald's office by Sir Chriſtopher Hatton; and aſcended gradually through all the degrees, until he became garter principal king at arms. His chief work is the *Monaſticon Anglicanum*, in three vols folio; containing the charters and deſcriptions of all the Engliſh monaſteries, adorned with engravings: in the former part of which work he was aſſiſted by Mr Roger Dodſworth. Nor are his Antiquities of Warwickſhire leſs eſteemed. He wrote likewiſe, among other things of leſs note, the Hiſtory of St Paul's Cathedral; a Hiſtory of Embanking and Draining; a Baronage of England; and completed the ſecond volume of Sir Henry Spelman's Councils, with a ſecond part of his Gloſſary. He died in 1686. His ſon, Sir John, was Norroy king at arms, and publiſhed a Catalogue of Engliſh Nobility. His daughter Elizabeth married the famous Elias Aſhmole.

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* See the article *Battel*.

DUILLIA LEX, was enacted by M. Duillius, a tribune, in the year of Rome 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magiſtrate without a ſufficient cauſe. Another in 392, to regulate what intereſt ought to be paid for money lent.

C. DUILLIUS NEPOS, a Roman conſul, the firſt who obtained a victory over the naval power of Carthage in the year of Rome 492. He took fifty of the enemy's ſhips, and was honoured with a naval triumph, the firſt that ever appeared at Rome. The ſenate rewarded his valour by permitting him to have muſic playing and torches lighted at the public expence every day while he was at ſupper. There were ſome medals ſtruck in commemoration of this victory; and there exiſts a column at Rome which was erected on the occaſion.

DUKE, DUX, a ſovereign prince, without the title or quality of king. Such are the Duke of Lorrain, of Holſtein, Savoy, of Parma, &c. The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are alſo two ſovereigns who bear the title of *grand-duke;* as the grand-duke of Tuſcany, and the grand-duke of Muſcovy, now called the *czar* or emperor of Ruſſia. The title of *great duke* belongs to the apparent heir of Ruſſia; and the title of *arch-duke* is given to all the ſons of the houſe of Auſtria, as that of *arch-ducheſs* to all the daughters.

DUKE, *Dux*, is alſo a title of honour or nobility, the next below princes.

The dukedom or dignity of duke is a Roman dignity, denominated *a ducendo*, "leading" or "commanding." Accordingly, the firſt dukes, *duces*, were the *ductores exercituum*, "commanders of armies." Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after times the ſame denomination was alſo given to the governors of provinces in time of peace. The firſt governor under the name of *duke* was a duke of the Marchia Rhætica, or Griſons, whereof mention is made in Caſſiodorus; and there were afterwards thirteen dukes in the eaſtern empire, and twelve in the weſtern. The Goths and Vandals, upon their over-running the provinces of the weſtern empire, aboliſhed the Roman dignities whereever they ſettled. But the Franks, &c. to pleaſe the Gauls, who had long been uſed to that form of government, made it a point of politics not to change any thing therein: and accordingly they divided all Gaul into duchies and counties; and gave the names ſometimes of dukes, and ſometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden obſerves, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his ſon Edward, firſt called the *Black Prince*, duke of Cornwall; which hath ever ſince been the peculiar inheritance of the king's eldeſt ſon during the life of his father; ſo that he is *dux natus, non creatus*. After whom there were more made, in ſuch manner as that their titles deſcended to their poſterity. They were created with much ſolemnity, *per cincturam gladii, cappæque, & circuli aurei in capite impoſitionem*. However, in the reign of Queen Elizabeth, A.D. 1572, the whole order became utterly extinct; but it was revived about 50 years afterwards by her ſucceſſor, in the perſon of George Villiers duke of Buckingham.

Though the French retained the names and form of the ducal government, yet under their ſecond race of kings there were ſcarce any ſuch thing as dukes: but all the great lords were called *counts, peers*, or *barons;* excepting, however, the dukes of Burgundy and Aquitain; and the duke of France, which was a dignity Hugh Capet himſelf held, correſponding to the modern dignity of maire de palais, or the king's lieutenant. By the weakneſs of the kings, the dukes or governors ſometimes made themſelves ſovereigns of the provinces truſted to their adminiſtration. This change happened chiefly about the time of Hugh Capet; when the great lords began to diſmember the kingdom, ſo that that prince found more competitors among them than ſubjects. It was even with a great deal of difficulty they could be brought to own him their ſuperior, or to hold of him by faith and homage. By degrees, what with force, and what by marriages, theſe provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors of provinces. From that time duke became a mere title of dignity, annexed to a perſon and his heirs male, without giving him any domain, territory, or juriſdiction over the place whereof he was duke. All the advantages thereof now conſiſt in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient ſplendor but the coronet on their eſcutcheon, which is the only mark of their departed ſovereignty. They are created by patent, cincture of the ſword, mantle of ſtate, impoſition of a cape, and coronet of gold on the head, and a verge of gold in their hand.

The eldeſt ſons of dukes are by the courteſy of England ſtyled *marquiſſes*, though they are uſually diſtinguiſhed by their father's ſecond title, whether it be that of marquis or earl; and the younger ſons *lords*, with the addition of their Chriſtian name, as Lord James, Lord Thomas, &c. and they take place of viſcounts, though not ſo privileged by the laws of the land.

A duke has the title of *grace;* and being writ to, he is ſtyled, in the heralds language, *moſt high, potent, and noble prince*. Dukes of the blood royal are ſtyled *moſt high, moſt mighty, and illuſtrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a ſpecies of accents anſwering to our comma. See ACCENT.

DUKE-Duke, a quality given in Spain to a grandee of the houſe of Sylva, on account of his having ſeveral duchies from the uniting of two conſiderable houſes in his perſon. Don Roderigo de Sylva, eldeſt ſon of Don

Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldeſt daughter of the Duke de l'Infantado; in virtue of which marriage, the preſent Duke de Paſtrana, who is deſcended therefrom, and is grandſon of Don Roderigo de Sylva, has added to his other great titles that of duke-duke, to diſtinguiſh himſelf from the other dukes; ſome whereof may enjoy ſeveral duchies, but none ſo conſiderable ones, nor the titles of ſuch eminent families.

DULCIFYING, in chemiſtry, is the ſweetening any matter impregnated with ſalts, by frequently waſhing it in pure water.

DULL, in the manege. The marks of a dull horſe, called by the French *marquis de ladre*, are white ſpots round the eye and on the tip of the noſe, upon any general colour whatſoever. Though the vulgar take theſe ſpots for ſigns of ſtupidity, it is certain they are great marks of the goodneſs of a horſe; and the horſes that have them are very ſenſible and quick upon the ſpur.

DULLART (Heiman), a Dutch painter and poet. He was a pupil to Rembrandt, for whoſe works the few he left are often miſtaken. He died in 1684.

DUMBARTON. See DUNBARTON.

DUMBNESS, the privation of the faculty of ſpeech. The moſt general, or rather the ſole cauſe of dumbneſs, is the want of the ſenſe of hearing. The uſe of language is originally acquired by imitating articulate ſounds. From this ſource of intelligence, deaf people are entirely excluded: they cannot acquire articulate ſounds by the ear: unleſs, therefore, articulation be communicated to them by ſome other medium, theſe unhappy people muſt for ever be deprived of the uſe of language; and as language is the principal ſource of knowledge, whoever has the misfortune to want the ſenſe of hearing, muſt remain in a ſtate little ſuperior to that of the brute creation. Deafneſs has in all ages been conſidered as ſuch a total obſtruction to ſpeech or written language, that an attempt to teach the deaf to ſpeak or read has been uniformly regarded as impracticable, till Dr Wallis and ſome others have of late ſhown, that although deaf people cannot learn to ſpeak or read by the direction of the ear, there are other ſources of imitation, by which the ſame effect may be produced. The organs of hearing and of ſpeech have little or no connection. Perſons deprived of the former generally poſſeſs the latter in ſuch perfection, that nothing further is neceſſary, in order to make them articulate, than to teach them how to uſe theſe organs. This indeed is no eaſy taſk; but experience ſhows that it is practicable. Mr THOMAS BRAIDWOOD, late of Edinburgh, was perhaps the firſt who ever brought this ſurpriſing art to any degree of perfection. He began with a ſingle pupil in 1764; and ſince that period has taught great numbers of people born deaf to ſpeak diſtinctly; to read, to write, to underſtand figures, the principles of religion and morality, &c. At the time we firſt converſed with him, being a few years after the commencement of his practice, he had a conſiderable number of deaf pupils, ſome of them above 20 years of age, all making a rapid and amazing progreſs in thoſe uſeful branches of education.

Mr Braidwood's principal difficulty, after he had diſcovered this art, was to make people believe in the practicability of it. He advertiſed in the public papers; he exhibited his pupils to many noblemen and gentlemen; ſtill he found the generality of mankind unwilling to believe him. A remarkable inſtance of this incredulity occurred ſome years ago. A gentleman in England ſent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could ſpeak, read, and write diſtinctly. The father returned an anſwer, begging Mr Braidwood's excuſe, as he could not believe it; however, he deſired a friend of his, who was occaſionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him: he did ſo; converſed with Mr Braidwood, ſaw the young lady, heard her read, ſpeak, and anſwer any queſtions he put to her. On his return, he told the father the ſurpriſing progreſs his child had made; but ſtill the father thought the whole an impoſition: the girl herſelf wrote to her father, but he looked upon the letter as a forgery. About this time the father died; and the mother ſent an uncle and couſin of the deaf lady's from Shrewſbury, in order to be ſatisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and couſin were in the parlour; and deſired her to go and aſk them how they did, and how her mother and other friends did. The friends were aſtoniſhed, and could hardly credit their own ears and eyes.

When we converſed with Mr Braidwood concerning the nature and method of teaching this wonderful art, he ſeemed to be very deſirous of communicating and tranſmitting his diſcovery to poſterity; but obſerved, from the nature of the thing we believe it to be true, that he could not communicate it ſo fully in writing as to enable any other perſon to teach it. The firſt thing in the method is, to teach the pupil to pronounce the ſimple ſounds of the vowels and conſonants. We have even ſeen him performing this operation; but are unable to give a clear idea of it. He pronounces the ſound of *a* ſlowly, pointing out the figure of the letter at the ſame time; makes his pupil obſerve the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depreſſes or elevates the tongue, and makes him keep the parts in that poſition; then he lays hold of the outſide of the windpipe, and gives it ſome kind of ſqueeze, which it is impoſſible to deſcribe: all the while he is pronouncing *a*, the pupil is anxiouſly imitating him, but at firſt ſeems not to underſtand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the ſounds of the letters. He goes on in the ſame manner to join a vowel and a conſonant, till at length the pupil is enabled both to ſpeak and read.

That his pupils were taught not only the mere *pronunciation*, but alſo to underſtand the *meaning* of what they read, was eaſily aſcertained by a converſation with any of them. Of this Mr Pennant gives a remarkable inſtance in a young lady of about 13 years of age, who had been ſome time under the care of Mr Braidwood. "She readily apprehended (ſays he) all I ſaid, and returned me anſwers with the utmoſt facility. She read; ſhe wrote well. Her reading was not by rote. She could clothe the ſame thoughts in a new ſet of words, and never vary from the original ſenſe. I have forgot the book ſhe took up, or the ſentences ſhe made a new verſion of: but the effect was as follows:

“ *Original paſſage.* Lord Bacon has divided the whole of human knowledge into hiſtory, poetry, and philoſophy; which are referred to the three powers of the mind, memory, imagination, and reaſon.

“ *Verſion.* A nobleman has parted the total or all of man's ſtudy or underſtanding into, An account of the life, manners, religion or cuſtoms of any people or country; verſe or metre; moral or natural knowledge: which are pointed to the three faculties of the ſoul or ſpirit; the faculty of remembering what is paſt, thought or conception, and right judgment.”

Mr Braidwood's ſucceſs ſince he went to ſettle in London is univerſally known. Several other perſons have ſince attempted the ſame art with various degrees of ability. But a new and different method, equally laborious and ſucceſsful, we underſtand, is practiſed by the Abbé de l'Epee of Berlin. We are informed * that he begins his inſtructions not by endeavouring to form the organs of ſpeech to articulate ſounds, but by communicating ideas to the mind by means of ſigns and characters: to effect this, he writes the names of things; and, by a regular ſyſtem of ſigns, eſtabliſhes a connection between theſe words and the ideas to be excited by them. After he has thus furniſhed his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a theſis againſt the objections of one of his fellow-pupils in a ſcholaſtic diſputation; in which the arguments of each were communicated to the other, but whether by ſigns or in writing is not ſaid; for it does not appear that the Abbé teaches his pupils to diſcern what is ſpoken, by obſerving the motion of the organs of ſpeech, which thoſe inſtructed by Meſſrs Braidwoods are able to do with aſtoniſhing readineſs.

There is perhaps no word, ſays the Abbé, more difficult to explain by ſigns than the verb *croire*, “ to believe.” To do this, he writes the verb with its ſignifications in the following manner:

Je crois {
Je dis oui par l'eſprit, Je penſe que oui.
Je dis oui par le coeur, J'aime à penſer que oui.
Je dis oui par la bouche.
Je ne vois pas des yeux.

After teaching theſe four ſignifications, which he does by as many ſigns, he connects them with the verb, and adds other ſigns to expreſs the number, perſon, tenſe, and mood, in which it is uſed. If to the four ſigns, correſponding with the lines above mentioned, be added that of a ſubſtantive, the pupil will write the word *foi*, “ faith;” but, if a ſign, indicating a participle uſed ſubſtantively, be adjoined, he will expreſs *la croyance*, “ belief;” to make him write *croyable*, “ credible,” the four ſigns of the verb muſt be accompanied with one that indicates an adjective terminating in *able*; all theſe ſigns are rapidly made, and immediately comprehended.

M. Linguet, a member of the Royal Academy, having aſſerted that perſons thus inſtructed could be conſidered as little more than automata, the Abbé invited him to be preſent at his leſſons, and expreſſed his aſtoniſhment that M. Linguet ſhould be ſo prejudiced in favour of the medium by which he had received the firſt rudiments of knowledge, as to conclude that they could not be imparted by any other; deſiring him, at the ſame time, to reflect, that the connection between ideas and the articulate ſounds, by which they are excited in the mind, is not leſs arbitrary than that between theſe ideas and the written characters which are made to repreſent them to the eye. M. Linguet complied with the invitation; and the Abbé having deſired him to fix on ſome abſtract term which he would by ſigns communicate to his pupils, he choſe the word *unintelligibility*; which, to his aſtoniſhment, was almoſt inſtantly written by one of them. The Abbé informed him, that to communicate this word he had uſed five ſigns, which, though ſcarcely perceivable to him, were immediately and diſtinctly apprehended by his ſcholars: the firſt of theſe ſigns indicated an internal action; the ſecond repreſented the act of a mind that reads internally, or, in other words, comprehends what is propoſed to it; a third ſignified that ſuch a diſpoſition is poſſible; theſe, taken together, form the word *intelligible*: a fourth ſign transforms the adjective into the ſubſtantive; and a fifth, expreſſing negation, completes the word required. M. Linguet afterwards propoſed this queſtion, *What do you underſtand by metaphyſical ideas?* which being committed to writing, a young lady immediately anſwered on paper in the following terms: “ I underſtand the ideas of things which are independent of our ſenſes, which are beyond the reach of our ſenſes, which make no impreſſion on our ſenſes, which cannot be perceived by our ſenſes.” On reading this, we cannot help exclaiming with the poet, *Labor omnia vincit improbus*? a maxim by none more forcibly illuſtrated than by the Abbé de l'Epee.

Periodical DUMBNESS. In the Ephemerides of the Curious, we have an account of a periodical dumbneſs, which had continued for more than 15 years, and had not gone off at the time the account was wrote. The perſon was ſon to an inn-keeper at Jeſing in the duchy of Wirtemberg in Germany. He was one night taken ſo ill after ſupper, that he could neither ſtand nor ſit. He continued, for about an hour, oppreſſed with ſickneſs to ſuch a degree as to be in danger of ſuffocation. At the expiration of this time he grew better; but, during three months, he was much dejected, melancholy, and, at times, fearful. He was then ſuddenly ſtruck dumb, and became unable to pronounce the leaſt word, or form the leaſt ſound, though he could ſpeak very articulately before. The loſs of ſpeech was at firſt inſtantaneous, and continued only a few minutes: but the duration of it began to lengthen every day; ſo that it ſoon amounted to half an hour, two hours, three hours, and at laſt to 25 hours, yet without any order. At laſt the return of ſpeech kept ſo conſtant and regular an order, that, for 14 years together, he could not ſpeak except from noon, during the ſpace of one entire hour, to the preciſe moment of one o'clock. Every time he loſt his ſpeech, he felt ſomething riſe from his ſtomach to his throat. Excepting this loſs of ſpeech, he was afflicted with no other diſorder of any animal function. Both his internal and external ſenſes continued ſound: he heard always perfectly well, and anſwered the queſtions propoſed to him by geſtures or writing. All ſuſpicion of deceit was removed by his keeping exactly the ſame hour, though he had no acceſs to any inſtruments by which time can be meaſured.

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* *Nouv. Mem. de l'Academie Royale*, &c. *de Berlin*, 1785. [Mon. Rev. vol. lxxx. p. 651.]

DUMFERMLINE, a parliament-town of Scotland, ſituated in the county of Fife, 15 miles north-weſt of Edinburgh: W. Long. 30. 20. N. Lat. 56. 15. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princeſs Elizabeth, daughter of king James VI. and mother of the princeſs Sophia, from whom the preſent royal family are deſcended, was born. In the inn of this town is the marriage bed of James VI. and his queen; it is ſtill entire, and uſed by ſtrangers who lodge here. This place is noted for a manufactory of figured linen cloth called Diaper. The town gave title of earl to a baronet of the Seton family, which was forfeited in the year 1690.

DUMFRIES, a county in the ſouth of Scotland, comprehending the ſhire of Nithſdale, the ſtewartry of Annandale, and the lordſhip of Eſkdale, extends in length from north-weſt to ſouth-eaſt about 60 miles, and is about 30 miles in breadth where broadeſt. It is bounded on the ſouth-weſt by Galloway and part of Kyle; on the north-eaſt by the counties of Roxburgh, Selkirk, and Peebles; on the north-weſt by Clydeſdale; and on the ſouth-eaſt by Solway Frith and the marches between Scotland and England. A great part of the country is mountainous and overſpread with heath, well ſtocked with game of all kinds: but the valleys, through which the Eſk, the Annan, the Nith, and other ſmaller rivers run, are extremely pleaſant; and ſome of them well cultivated and very fertile, and produce oats, barley, and wheat in abundance, both for maintaining the inhabitants and for exportation; while the mountainous parts afford paſture for innumerable flocks of ſheep and herds of black cattle, many thouſands of which are annually exported to England. In the valleys are ſeveral natural woods and ſome extenſive plantations of different kinds of timber. In the diviſion called *Nithſdale*, are the rich lead mines of Wanlockhead, the coal mines of Sanquhar and Cairnburn, the inexhauſtible lime-quarries of Cloſeburn and Barjarg, and free ſtone in almoſt every pariſh. Annandale has the rich lime-quarries of Kellhead and Comtongan, with plenty of free ſtone near the towns of Annan and Lochmaben: and in the lower part of Eſkdale are lime ſtone and coal in abundance.

DUMFRIES, the capital of the above mentioned county, a handſome town, ſituated on a ridge or riſing ground on the north-eaſt ſide of the river Nith, about 10 miles above where it falls into Solway Frith, in N. Lat. 55. 8. 30. Long. W. of Greenwich Obſervatory, 3. 56. Its ancient name, it is ſaid by ſome of the Scotch hiſtorians, was *Cotiac*; but on what authority we cannot tell. Its preſent name appears to have been derived partly from its ſituation, and partly from the monaſtery of Grey Friars that formerly ſtood near the head of the ſtreet called the *Friar-vennal*, the kitchen of which is all that now remains; being only a corruption of *Drum friars*, or "the eminence of the friars;" and accordingly, till within theſe 40 or 50 years, it was always ſpelt *Drumfries*, and not *Dumfries*, as it is now for the ſake of greater ſoftneſs. Beſides the pleaſantneſs of its ſituation on the ſide of a beautiful winding river, it is ſurrounded on all ſides with one of the fineſt and beſt cultivated ſheets of dale country that one can any where meet with, and the proſpect from it terminated at the diſtance of a few miles, by a continued chain of hills, forming altogether one of the grandeſt natural amphitheatres perhaps in Britain. There was anciently a ſtrong caſtle at the ſouth end of the town belonging to the Cummings, lords of Badenoch, of which there are now no remains. Another caſtle was afterwards built at the north-weſt end, which was taken down about 70 years ago. On the north-eaſt ſide of it, at ſome little diſtance, are the ruins of a chapel built by K. Robert Bruce, and endowed for a number of prieſts to ſay maſs for the repoſe of the ſoul of Sir Chriſtopher Seaton his brother-in-law, who was taken priſoner by Edward I. at Loch-Urr, and hanged at this place. It is now only employed as a burying place for ſuicides. It is not certain at what period Dumfries was erected into a royal borough; but it muſt have been before the middle of the eleventh century, as a grave-ſtone was diſcovered ſome time ago bearing the date of 1079, and mentioning the perſon buried under it to have been a merchant and burgeſs of the town: and that it was a place of conſequence in the beginning of the fourteenth century, is evident from this circumſtance, that Edward II. called the eſtates of Scotland to meet there in the year 1307. In the above mentioned monaſtery too, K. Robert Bruce killed his rival Cumming lord of Badenoch, with the aſſiſtance of James Lindſay and Roger Kirkpatrick, on the 5th of February 1305. As to the preſent ſtate of the town, the houſes are well built and commodious, the ſtreets ſpacious, open, and neatly paved. It has two very elegant churches, an epiſcopal chapel with a fine little organ, beſides three meeting-houſes belonging to different deſcriptions of ſectaries; a tolbooth; a council-chamber; a trades hall; a meal-market; a ſtrong priſon; a correction-houſe; a large hoſpital; an infirmary, with apartments for inſane patients; a narrow bridge of 9 arches over the river, ſaid to have been built by one of the three daughters and coheireſſes of Alan lord Galloway. A large village, called the *Bridge-end*, ſtands on the oppoſite ſide, and is within the ſtewartry of Kirkcudbright. The aſſizes for the county, and for the ſhire of Galloway and ſtewartry of Kirkcudbright, are held in the town twice a year. It is alſo the place for holding the ſheriff and commiſſary courts, the quarter-ſeſſions of the peace, and the courts of the commiſſioners of ſupply. It is governed by a provoſt, three bailies, a dean of guild, and a town-council, compoſed of merchants and the conveener and deacons of the incorporated trades, of which there are ſeven, viz. ſquare-men, ſmiths, weavers, tailors, ſhoemakers, ſkinners, and butchers; all of whom are choſen into their reſpective offices at Michaelmas annually. The trades got from king James VI. in one of his journeys to England, a ſmall ſilver tube, like a piſtol barrel, called the *ſilver gun*, with his royal licence to ſhoot for it every year. At that feſtival they all appear in arms, and march out of the town under their reſpective colours, to ſome convenient place, where they ſhoot at a mark; and the perſon that hits or ſhoots neareſt to it, returns to town, marching at the conveener's right hand, with the ſilver gun tied to his hat with ribbons; after which they conclude the day with a ſocial entertainment. The town has a weekly market on Wedneſday, with two annual fairs, the firſt on the Wedneſday on or next after the 13th of February, and the other on the Wedneſday on or next after the 25th of September. At theſe fairs vaſt numbers of horſes and black cattle are ſold; and no town in Scotland is better provided with all ſorts of butcher-meat in their ſeaſon. But though well ſituated for fuel at a cheap rate, it has only two manufactures, one for ſtockings and the other for cottons; but the latter only in its infancy. Its foreign trade for many years has only conſiſted in timber, iron, and other articles for home conſumption. It gives the title of Earl to the chief of the family of Crichton; and is the ſeat of a preſbytery and provincial ſynod. It contains about 6000 inhabitants.

DUMONT (Francis), a Frenchman; compiler of a general collection of treaties of commerce, alliance, and peace, between the powers of Europe. This collection, with Barbeyrac's, containing the treaties B. C. makes 16 vols folio, very uſeful for hiſtorical writers. Dumont retired to Holland in 1720. The time of his death is uncertain.

DUMOSÆ (from *dumus*, a buſh), an order of plants in the *Fragmenta methodi naturalis* of Linnæus, containing the following *genera*, viz. *Viburnum*, *Tinus*, *Opulus*, *Sambucus*, *Rondeletia*, *Bellonia*, *Caſſine*, *Ilex*, *Tomax*, &c.

Plate CLXV.

DUN, or BURGH, the name of an ancient ſpecies of buildings, of a circular form, common in the Orkney and Shetland iſlands, the Hebrides, and northern parts of Scotland. The latter term points out the founders, who at the ſame time beſtowed on them their natal name of *borg*, "a defence or caſtle," a Sueo-Gothic word; and the Highlanders univerſally apply to theſe places the Celtic name *dun*, ſignifying a hill defended by a tower, which plainly points out their uſe. They are confined to the countries once ſubject to the crown of Norway. With few exceptions, they are built within ſight of the ſea, and one or more within ſight of the other; ſo that on a ſignal by fire, by flag, or by trumpet, they could give notice of approaching danger, and yield a mutual ſuccour. In the Shetland and Orkney iſlands, they are moſt frequently called *wart* or *wardhills*, which ſhows that they were garriſoned. They had their wardmadher, or watchman, a ſort of centinel, who ſtood on the top, and challenged all who came in ſight. The gaekman was an officer of the ſame kind, who not only was on the watch againſt ſurprize, but was to give notice if he ſaw any ſhips in diſtreſs. He was allowed a large horn of generous liquor, which he had always by him, to keep up his ſpirits. Along the Orkney and Shetland ſhores, they almoſt form a chain; and by that means not only kept the natives in ſubjection, but were ſituated commodiouſly for covering the landing of their countrymen, who were perpetually roving on piratical expeditions. Theſe towers were even made uſe of as ſtate-priſons; for we learn from Torfæus, that after Sueno had ſurpriſed Paul, count of Caithneſs, he carried him into Sutherland, and confined him there in a Norwegian tower. Out of our own kingdom, no buildings ſimilar to theſe are to be found, except in Scandinavia. On the mountain Swalberg in Norway is one; the Stir-biſkop, at Upſal in Sweden, is another; and Umſeborg, in the ſame kingdom, is a third.

Theſe towers vary in their inner ſtructure; but externally are univerſally the ſame; yet ſome have an addition of ſtrength on the outſide. The burgh of Culſwick in Shetland, notwithſtanding it is built on the top of a hill, is ſurrounded with a dry ditch 13 feet broad; that of Snaburgh in Unſt, has both a wet and a dry ditch; the firſt cut, with great labour, through the live rock. The burgh of Moura is ſurrounded by a wall, now reduced to a heap of ſtones, and the inſide is cylindrical, not taper, as uſual with others. The burgh of Hogſter, upon an iſle in a loch of the ſame name, has alſo its addition of a wall; a peculiarity in a cauſeway, to join it to the main land, and a ſingular internal ſtructure. Numbers of little burghs, with ſingle cells, are ſcattered about theſe iſlands, in the neighbourhood of the greater; and which probably were built by the poorer ſort of people, in order to enjoy their protection. A multitude of places in theſe iſlands have the addition of burgh to their names, notwithſtanding there is not a veſtige of a tower near them; the materials having long ſince been carried away, and applied to various uſes.

DUNBAR, a parliament town of Scotland, in the ſhire of Mid-Lothian, once remarkable for a ſtrong caſtle, the key of Scotland from the eaſt, and which gave ſhelter to Edward II. of England in his flight from Bannockburn, but of which ſcarce a veſtige now remains. Here are ſtill preſerved ſome of the Scottiſh pikes, ſix ells long, and formed for both offence and defence. This town has now a tolerable trade in the fiſheries, and is remarkable for making good malt. Dunbar has given titles of honour to different families, who are all now extinct.

DUNBARTON, the chief town of Lenox or Dunbarton ſhire in Scotland, ſituated in W. Long. 4. 32. N. Lat. 56. 30. It is remarkable for nothing but its caſtle. This is a ſteep rock, riſing up in two points, and every where inacceſſible, except by a very narrow paſſage or entry, fortified with a ſtrong wall or rampart. Within this wall is the guard-houſe, with lodgings for the officers; and from hence a long flight of ſtone-ſteps aſcends to the upper part of the caſtle, where there are ſeveral batteries mounted with cannon, the wall being continued almoſt round the rock. In the middle of this upper part where the rock divides, there are commodious barracks with a deep well, in which there is always plenty of water. Here likewiſe are the remains of a gateway and prodigious high wall, at the top of which there was a wooden bridge of communication from one rock to another. This gateway was ſometimes blocked up during the inteſtine commotions of Scotland, ſo that garriſons of different factions poſſeſſed different parts of the caſtle, and each had a gate towards the water. The caſtle ſtands in the angle formed at the conflux of the Clyde and Leven; ſo that it is wholly ſurrounded by water, except a narrow iſthmus, and even this is overflowed at every ſpring-tide: nor is there any hill or eminence within a Scots mile of this fortreſs. It commands the navigation of the Clyde; and, being deemed the key of the weſtern Highlands, is kept in ſome repair, and garriſoned with invalids, under the command of a governor and ſome ſubaltern officers. The government of it is worth 700 l. a-year.——Dunbarton is a royal borough; and formerly gave title of Earl to a branch of the family of Douglas.

DUNCANNON, a fort in the county of Wexford, and province of Leinſter, in Ireland, ſtated on the river Roſs. It commands the river, inſomuch that no ſhip can paſs to Waterford or Roſs without its permiſſion. Here are barracks for three companies of foot. W. Long. 6. 30. N. Lat. 52. 10.

DUNCARDS, Dunkers, or *Tunkers*. See Tunkers.

DUNCOMBE (William), younger ſon of John Duncombe, Eſq; of Stocks in Hertfordſhire, in 1722 publiſhed a tranſlation of Racine's Athaliah; which was well received by the public, and has gone through three editions. In 1724 he was editor of the works of Mr Needler; in 1735, of the poems of his deceaſed brother-in-law, Mr Hughes, 2 vols 12mo; in 1737, of the miſcellanies of his younger brother Mr Jabez Hughes, for the benefit of his widow, in one volume 8vo; and in 1745, of the works of the Rev. Mr Samuel Say, in one volume 4to. In 1726 he married the only ſiſter of John Hughes, Eſq; whom he long ſurvived. In 1734 his tragedy of Lucius Junius Brutus was acted at Drury-Lane Theatre. It was publiſhed in 1735, and again in 1747. The works of Horace, in Engliſh verſe, by ſeveral hands, were publiſhed by him in two vols 8vo, with notes, &c. in 1757. A ſecond edition, in four vols 12mo, with many imitations, was publiſhed in 1762. In 1763 he collected and republiſhed "Seven ſermons by archbiſhop Herring, on public occaſions, with a biographical preface." He died Feb. 26. 1769, aged 80.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin. It is a large, ancient, and thriving town, with a wide ſtreet, near a mile long, and a very fine market-houſe, near the entrance from Dublin. In the reign of Edward II. it was a royal city, and the laſt we read of where a monarch of all Ireland was actually crowned and reſided. It was formerly very ſtrong, and had many towers and ſmall caſtles in it. It is very advantageouſly ſituated for a moſt extenſive inland trade, and the port is very ſafe for ſhipping. The bay has good moorings at all times, in four to upwards of eight fathoms water, with very good land-marks, either for bringing up to, or making the harbour; and in croſſing the bar at high water, or ordinary neap-tides, there is from 15 to 18 feet water. The only cambric manufacture in Ireland is carried on in this town.

DUNDEE, a parliament town of Scotland, in the ſhire of Forfar or Angus, is ſeated on the north ſide of the river Tay, about 12 meaſured miles from its mouth, 40 meaſured miles north of Edinburgh, and 22 eaſt from Perth, in W. Long. 2. 48. N. Lat. 56. 26. Its ſituation for commerce is very advantageous. Trading veſſels of the largeſt burden can get into the harbour; and on the quay there are three very convenient and handſome warehouſes built in 1756, as well as good room for ſhipbuilding, which is carried on to a large extent. The houſes are built of ſtone, generally three and four ſtories high. The market-place or high ſtreet in the middle of the town is a very ſpacious oblong ſquare, 360 feet long and 100 feet broad; from whence branch out the four principal ſtreets, which with a number of leſſer ones are all paved in the beſt manner. On the ſouth ſide of the market-place ſtands the town-houſe; an elegant ſtructure, with a very handſome front, piazzas below, and a neat ſpire over it 140 feet high. This building was finiſhed in the year 1734, and contains the guild-hall, the court-room, a very neat maſon-lodge, the bank, vaulted repoſitories for the records, and the common priſon, which is in the upper ſtory, and does honour to the taſte and humanity of the magiſtrates, under whoſe auſpices it was conſtructed, being well aired commodious rooms, at the ſame time very ſtrong and ſecure. Each priſon is 20 feet by 12, and 7½ feet high, well arched above and below.

The meal-market and ſhambles, which were formerly on the high ſtreet, and eſteemed a nuiſance, were removed ſome years ago; and in the place of the ſhambles, there is now erected by the incorporated trades, on the eaſt end of the above large ſquare, a grand building, with a large and elegant cupola: in the ground-flat of which is a very neat coffee-room, and ſeveral merchant ſhops; and in the upper ſtories public rooms for each trade, and a common hall occaſionally uſed as a theatre. This hall is 50 feet long, 30 feet broad, and 25 feet high; having its front to the ſquare decorated with Ionic columns.

The opulence of the corporations, nine in number, may be inferred from this, that they had, along with the kirk-ſeſſion, but very lately finiſhed a moſt elegant church when they ſet about building the hall. This church, which is called *St Andrew's Church*, ſtands on a riſing ground a little north from the Cowgate ſtreet; and has an elegant ſpire 130 feet high, with a peal of bells much admired. There is a neat entry to the church by a broad gravel walk, with graſs plots on every ſide; and the whole policies around it are laid out with excellent taſte, and in a ſuperb ſtile, as complete and well executed as any in Scotland.

Dundee, beſide St Andrew's church, has four other churches, and five miniſters on the legal eſtabliſhment. The old church, in which were originally four places of worſhip, when entire, had been a very magnificent building, with a large ſquare Gothic tower or ſteeple 186 feet high, on the weſt end of the church. This building was in the form of a croſs, erected by David Earl of Huntington, brother to William I. of Scotland (ſurnamed the Lion), and was dedicated to the Virgin Mary. This he did on his return from the third cruſade (in which with 500 of his countrymen he had accompanied Richard I. of England) *anno* 1189, in gratitude for his deliverance from ſeveral imminent dangers, and particularly from ſhipwreck, by which he had nearly periſhed when in ſight of this town. At the ſame time he changed the name of the town from *Allectum* to *Dei Donum*, whence its preſent name is thought by many to be derived; while others maintain that its name was *Duntay*, or "the Hill of Tay." The word *Allectum* in the Gaelic ſignifies "beautiful," and harmonizes very well with the ſcripture ſenſe of the Hill of God. The word *Duntay* has the very ſame ſignification, "the Hill of God;" and both agree with the delightful ſituation of Dundee, and unite in giving it with propriety the name of *Bonny Dundee*. The hill riſes on the north of the town to a great height, and is called *The Law of Dundee; law* being a Saxon word for a round hill, ſuch as it is. On its top there are evidently the remains of a camp, ſaid to have been firſt erected by Edward I. of England, and laſtly repaired by General Monk. Where the meal-market ſtood is now erected an elegant Epiſcopal meeting-houſe, with handſome ſhops below.

Dundee had an old caſtle which was demoliſhed by the famous Scots governor Sir William Wallace, who was educated in this town. The caſtle had proved very uſeful to Edward I. when he put a garriſon into it to awe the inhabitants; but Wallace getting poſſeſſion, ordered it to be deſtroyed, leſt it ſhould again fall into the hands of the Engliſh. This treatment ſo exaſperated Edward, that, taking the town by ſtorm, he ſet fire to the churches; and a number of the inhabitants having taken ſanctuary there with their moſt valuable effects, were all burnt along with them. At that time he burnt alſo a great part of the town. The deſolation he brought on the church has continued ever ſince, till the year 1787, when a noble edifice began to be built on the ſite of the one that was burnt down, and is now finiſhing; in which the ancient Gothic of the outſide is excellently united with internal modern architecture, making one of the largeſt and neateſt churches in the kingdom, and again completing the ſuperb ſuperſtructure as erected at the firſt by the Earl of Huntington.

This town ſuffered greatly laſt century during the troubles of Charles II. and the uſurpation of Oliver Cromwell; being ſometimes under the command of one party, and at others in the mercy of another. In 1645 the Marquis of Montroſe took it by ſtorm; and in 1651, under the command of its provoſt Major General Lumſden, it vigorouſly oppoſed General Monk, who carried it by ſtorm the firſt of September, and put all in arms to the ſword. And ſo great were the riches of Dundee, all the neighbouring gentlemen having retired to it with their beſt effects as a place of ſafety, that every private ſoldier in General Monk's army had near 60 l. Sterling to his ſhare of the plunder; there being above 60 merchant veſſels in the harbour at that time, and the like number of veſſels ſailed for England loaded with the ſpoils of the unfortunate inhabitants. By theſe and other invaſions, the whole ancient records of the town were deſtroyed, except a deed of Queen Mary, ſigned by herſelf, conferring the preſent burying ground; and ſome charters of the Charles's, confirming the ancient rights and privileges as diſponed by the Alexanders and others kings of Scotland. This burying-ground is the only place in Scotland we know of called *The Hoff*, a Dutch word bearing all the ſenſes of the Engliſh word *court*, having been formerly the burying-ground of one of the many religious houſes that were in this town previous to the Reformation.

Dundee at preſent has 113 veſſels belonging to the port, of above 8200 tons burden, and near 1000 ſeamen. Of theſe veſſels four went laſt ſeaſon to Greenland, a trade of long ſtanding here. And beſide the three public warehouſes on the ſhore, there are above twenty large private warehouſes belonging to the merchants. The magiſtrates have been lately and ſtill are at great expence in enlarging and fitting up the harbour, ſo as to render it of eaſy acceſs, ſafe, and commodious; and have now made the paſſage over the Tay, where there is a great reſort, ſo convenient, that travellers with their horſes can get over at any time of tide, and a ſufficient number of good boats properly manned are always ready. The river Tay oppoſite Dundee is about three miles broad; and being ſheltered by high lands on both ſides, is a ſafe road for ſhips of the greateſt burden: the piers are extenſive, broad, and well adapted for the purpoſes of loading and diſcharging veſſels; and when the harbour is completed in the plan they are preſently engaged in, there will not be one ſuperior to it in Scotland.

To enable the town to repair the damage done by Cromwell's army, and alſo their harbour and other public works, Charles II. granted them a ſmall impoſt of one-ſixth of a penny Sterling, for 25 years, on the pint of ale brewed or brought into the town for ſale; which grant has been frequently renewed by ſubſequent parliaments; and the fund ariſing therefrom is moſt properly beſtowed by the magiſtrates in improving the town, and making it more convenient and healthy. For theſe purpoſes, ſeveral new ſtreets have been made, the old ones have been widened, and a large convenient one at a conſiderable expence carried down from the market-place to join a fine walk, ſhaded very neatly with trees, that leads to the ſhore. This new ſtreet makes the acceſs eaſy and commodious, which was formerly much confined and ſteep.

Till the year 1745, the town had only draw-wells; but ſince that period it is moſt amply ſupplied from a large fine fountain of excellent water, conveyed through the town in lead pipes, and diſcharged by good wells at proper diſtances. Theſe, with a fine well in the town's meadows, and a ſtream of water that runs thro' the ward and the meadows (two large beautiful greens on the north of the town), make it as well watered as any town in Scotland; and theſe greens, juſt at hand, ſerve all the inhabitants moſt commodiouſly for the neceſſary labours of waſhing and bleaching.

The number of inhabitants in Dundee have increaſed above 4000 ſince 1780. There was then an accurate liſt of them taken, when they amounted to near 16,000; and lately they were reckoned and found within a few of 20,000; and ſince the year 1760 they are fully doubled. Beſide the eſtabliſhed churches, there are three Epiſcopal meeting-houſes, two of Seceders, one of Methodiſts, two of Independents, one Berean, and two Anabaptiſts. One of the Independents is of the Glaſſite denomination. Mr John Glaſs, from whom they take that name, reſided here; and his principles, though ſpread far and wide, have always had the greateſt following in Dundee.

The trade in the town has increaſed amazingly of late. Its ſtaple is undoubtedly the linen manufacture: for which in ſummer 1788 they imported from the Baltic 32 cargoes of flax, hemp, &c. near 3000 tons, beſide ſeveral quantities from London, Leith, and other places; and on an average the brown linen ſtamped for the two preceding ſeaſons at the ſtamp-office here amounted to about four millions of yards, in value about 115,000 l. Sterling. The flax is wrought up into coarſe linens, chiefly Oſnaburgs, ſheetings, ſoldiers ſhirtings, &c. which is ſold partly bleached (ſeveral fine large bleachfields being well employed in the neighbourhood) and partly brown. Theſe linens are ſent principally to London, Glaſgow, and Liverpool, and from thence exported. Seven or eight veſſels are conſtantly employed in the trade between Dundee and London, one of which ſails every ten or twelve days. The making ſail-cloth has been long eſtabliſhed here, and is carried on to a good extent. Two rope-works have ſucceeded well, and a buckram-work has alſo been eſtabliſhed for ſeveral years. The Dundee coloured threads have been long juſtly eſteemed, and give bread to a great number of people; indeed it was here that coloured threads firſt made a figure among the articles of trade in Scotland. Their ſugar-houſe, a large undertaking, and tan-works, are of eſtabliſhed reputation. There has been lately erected a large glaſs-work at a great expence, and a plumbery and foundery are alſo now carried on to advantage. No doubt the trade of the place has been greatly promoted by the Bank; which is carried forward on the ſureſt and moſt ſteady footing, and has always managed the buſineſs of the town and neighbourhood in ſuch a way as to keep any other eſtabliſhment of that kind from taking place. Of late the cotton manufactory has been introduced; a number of jennies being employed in ſpinning, and ſeveral looms in weaving it. A large machine for ſpinning ſhorts or backens into candlewicks, the firſt of the kind in Scotland, is alſo begun to work here, and promiſes to do well. A ſpirit for literature and education has greatly prevailed of late years in Dundee: for beſide the public grammar-ſchool, which has an able rector and two good maſters; the public Engliſh and writing ſchool, where are three very proper maſters; there is alſo lately eſtabliſhed, and much encouraged, an academy for mathematics, French, Italian, and the polite arts, with maſters ſuitable for the different branches, and a large apparatus for natural philoſophy.

The ſalmon fiſhing in Tay is of much conſequence; and the town is generally well ſupplied with fiſh of various kinds, though like every other article of living much raiſed in price of late years. Their other markets are alſo well ſupplied. An excellent nurſery at the weſt end of the town has been much encouraged; and its neighbourhood is now adorned with many neat and elegant villas, ſhowing the wealth and taſte of the inhabitants.

Dundee is the birth-place of the celebrated and learned Hector Boethius, whoſe Hiſtory of Scotland has been long in much reputation with many. It, with Perth, Forfar, St Andrew's, and Cupar, returns one member to the Britiſh parliament.

DUNFERMLINE. See Dumfermline.

DUNG, in huſbandry. See Agriculture, n° 20.

Dung-Bird. See Upupa.

Dung Meers, in huſbandry, places where ſoils and dungs are mixed and digeſted together. Theſe conſiſt of pits, prepared at the bottom with ſtone and clay, that they may hold water, or the moiſture of the dung; and ought to be ſo ſituated, that the ſinks and drips of the houſes and barns may run into them. Into theſe pits they caſt refuſe, fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occaſion for them.

Dung Worms, a ſpecies of fly-worms, of a ſhort and ſomewhat flat body, found in great plenty among cow-dung in the months of September and October.

DUNGANNON, the chief town of the county of Tyrone, in the province of Ulſter in Ireland. It is ſeated on a hill, and is a place of ſome ſtrength.

DUNGARVON, a town of Ireland, in the county of Waterford. It ſtands on a bay of the ſame name, has a commodious harbour for ſhips, and is a walled town with a caſtle. W. Long. 7. 55. N. Lat. 51. 57.

DUNIPACE. See the article Carron.

DUNKELD, a town of Scotland, in the ſhire of Perth, ſeated on the north ſide of the river Tay, in a ſituation truly romantic, under and among very high and almoſt inacceſſible craggs, part naked and part wooded. It is the chief market town of the Highlands, and has been greatly improved with buildings by the Dukes of Athol.

The place is of great antiquity. It was the capital of ancient Caledonia. About the dawn of Chriſtianity, a Pictiſh king made it the ſeat of religion, by erecting a monaſtery of Culdees there; which King David I. in 1130 converted into a cathedral, and it ranked as the firſt in Scotland. The entire ſhell of the cathedral ſtill remains, the eaſt end ſerving for a kirk, on the north ſide of which is the burial place of the Dukes of Athol. The ſtyle of architecture is ſimple and elegant, the pillars round. The monument of one of its biſhops remains in the ſouth aiſle of the nave, as alſo that of Alexander Stuart Earl of Buchan, third ſon of Robert II. called for his cruelty *The Wolf of Badenoch*, who died 1394. The tower at the weſt end, with a ſingular crack down one of its ſides, adds to the pictureſque appearance which the whole makes among the venerable pines at the end of the Duke's garden. His Grace's ſeat is a modern building, and not large, with pleaſant walks and policies, and a fine caſcade on the water of Bran, which in its way from the weſtern hills forms an aſtoniſhing fall of 150 feet, called the *Rumbling Brig*, from a narrow bridge made by the fall of two rocks acroſs the ſtream. The pencil of Roſa never formed a more horrid ſcene. The ſtream has a ſecond fall, which, without ſeeing the other, would be deemed capital. Sir James Galloway, maſter of requeſts to James VI. and Charles I. was created Lord Dunkeld 1645, whoſe grandſon James was attainted at the Revolution, and dying at the beginning of this century, the title became extinct.

DUNKERS, Duncards, or *Tunkers*. See Tunkers.

DUNKIRK, a maritime town of the French Netherlands, ſituated in E. Long. 2. 28. N. Lat. 51. 10. and is the moſt eaſterly harbour on the ſide of France which is next to Great Britain.—It was originally a mean hamlet, conſiſting only of a few fiſhermens huts; but a church being built there, it was from that, and from its ſituation, which is a ſandy eminence, called *Dunkirk; dun* ſignifying, in the old Gallic language, a hill; and *kirk* being the old Flemiſh name for church.

About the year 960, Baldwin Earl of Flanders, thinking the ſituation convenient, enlarged it into a kind of town, and ſurrounded it with a wall. In the year 1322, Robert of Flanders, who held it as an appendage, built a caſtle for its defence; which was afterwards demoliſhed by the revolters of Flanders. Robert of Bar erected a fortification round it, the remains of which are viſible on the ſide next the harbour. The emperor Charles V. who held it as part of Flanders, built another caſtle to defend the harbour; but this was alſo demoliſhed ſoon afterwards. In 1558, the French, under Marſhal de Thermes, took Dunkirk by ſtorm, and almoſt ruined the place; the Spaniards recovered it again in about a fortnight, and put all the French to the ſword.

During a peace procured for the Dunkirkers by Philip II. of Spain, they rebuilt their town with greater ſplendor than before, and the inhabitants for a long time ſubſiſted by privateers fitted out againſt the Dutch; and at length, growing rich by theſe hoſtilities, they fortified their town and harbour, and fitted out no leſs than 15 ſhips of war at their own charge.

In 1634, the Dunkirkers agreed with the inhabitants of Bergues to dig a canal, at their joint expence, for a communication between the two towns; which was ſome time afterwards effected. By this time, Dunkirk was become the beſt harbour the Spaniards poſſeſſed in Flanders, which induced many foreigners to ſettle there; and it being neceſſary to enlarge the town for their accommodation, a new fortified wall was built at a conſiderable diſtance from the former. In 1646, it was beſieged and taken by the prince of Condé. In 1652 it was retaken by the archduke Leopold, then governor of the Netherlands. France entering into a treaty with England in 1655, the Dunkirkers, with views of pecuniary advantage, fitted out privateers againſt both thoſe powers: the conſequence of which was, that the French, aſſiſted by Cromwell, attacked and took it; and it was put into the hands of the Engliſh, in conſequence of a treaty between them and the French. To the Engliſh it was even then of very great importance; for, during the war in which it was taken, the Dunkirkers had made prizes of no leſs than 250 of their ſhips, many of which were of great value. They therefore improved the fortifications, and built a citadel: yet they kept it only four years; for in 1662, two years after the reſtoration, Charles II. ſold this valuable acquiſition to France, for the paltry ſum of 500,000l. In conſequence of this ſale, the town was taken poſſeſſion of for the French king Louis XIV. by the count d'Eſtrades, on the 29th of November 1662. Louis having acquainted the celebrated engineer Monſieur Vauban, that he intended to make Dunkirk one of the ſtrongeſt places in Europe, Vauban drew up a plan with that view, which was gradually executed. An arſenal was erected, large enough to contain all the ſtores neceſſary for fitting out and maintaining a large fleet of men of war; the fortifications on the land-ſide were conſtructed in a manner that was thought to render them impregnable; and towards the ſea, the entrance of the harbour being properly formed, it was fortified by the jetties, and the two forts called *Green Fort* and the *Fort of Good Hope* at their extremities; the famous Riſbank was alſo erected on one ſide of the jetties, and Fort Galliard on the other, to ſecure the town. Theſe works were all completed in 1683; and in 1685, the whole circumference of the baſon was faced with maſonry, and the keys completely formed: at the ſame time care was taken to build at the entrance of this baſon a ſluice, almoſt 45 feet wide, that the ſhips within might be conſtantly afloat. In 1689, the fort called the *Cornichon*, and ſome other works, were completed. But though 30 years had been now employed in improving the fortifications of Dunkirk, it was not yet in the ſtate in which Louis intended to put it; and therefore, in 1701, he cauſed a new riſbank to be built, called *Fort Blanc*.

At the treaty of Utrecht, it having been made appear, that the privateers of Dunkirk had, during the war then cloſing, taken from the Engliſh no leſs than 1614 prizes, valued at 1,334,375 l. Sterling, it was ſtipulated, that the fortifications of the city and port of Dunkirk ſhould be entirely demoliſhed, and the harbour filled up, ſo as never to be an harbour again.

The treaty, of which this demolition of Dunkirk was an article, was ſigned on the 28th of April 1713; but the demolition did not take place till the September following, when the queen deputed colonel Armſtrong and colonel Clayton to overſee the execution of the treaty as far as concerned the works and harbour of Dunkirk.

Under the inſpection of theſe gentlemen, the places of arms were broken down, the ditches filled up, and the demi-lunes, baſtions, and covered way, totally deſtroyed; the citadel was razed, and the harbour and baſon filled up; the jetties were alſo levelled with the ſtrand, and all the forts which defended the entrance into the harbour were demoliſhed. A large dam, or bar, was alſo built acroſs the mouth of the harbour between the jetties and the town, by which all communication between the harbour and the canal, which formed its entrance, was entirely cut off. The ſluices were alſo broken up, and the materials of them broken to pieces.

But this was no ſooner done, than Louis XIV. ordered 30,000 men to work inceſſantly upon a new canal, the canal of Mardick, which in a ſhort time they accompliſhed; by which the harbour was rendered almoſt as commodious as ever: but in 1717 this likewiſe was rendered unſerviceable.

In the year 1720, during a great ſtorm, the ſea broke up the bar or dam, and reſtored to the Dunkirkers the uſe of the harbour in a very conſiderable degree.

In the year 1740, when Great Britain was engaged in a war with Spain, Louis XV. ſet out about improving the advantage which Dunkirk had derived from the ſtorm in 1720, by reſtoring the works, and repairing the harbour. He rebuilt the jetties and erected new forts in the place of thoſe which had been deſtroyed; and ſoon afterwards he eſpouſed the cauſe of Spain, and became a principal in the war againſt us.

But at the peace of Aix-la-Chapelle in 1748, it was ſtipulated, that all the works towards the ſea ſhould be deſtroyed a ſecond time; yet, before the declaration of the laſt war, the place was in as good a ſtate of defence towards the ſea as it was at any time during the war which was concluded by the treaty of Aix-la-Chapelle.

DUNSE, a market-town of Scotland, in the ſhire of Mers, ſituated in W. Long. 2. 15. N. Lat. 55. 42. It is ſeated on a riſing ground in the middle of the ſhire, and has a weekly market for cattle. It is by ſome reputed the birth-place of the famous John Duns Scotus.—A mile ſouth of the town is a well of mineral water, of great uſe as a deobſtruent and antiſcorbutic, firſt diſcovered in 1747 by Dr Thomas Simpſon who practiſed there.

Duns.

DUNS SCOTUS (John), a Franciſcan friar, commonly called *Doctor Subtilis*, was born in the year 1274; but whether in England, Scotland, or Ireland, hath long been a matter of diſpute among the learned of each nation. Dempſter, Mackenzie, and other Scottiſh writers, aſſert poſitively that he was born at Dunſe, a town in Scotland, about 15 miles from Berwick; and, to ſecure him more effectually, Mackenzie makes him deſcended from the Dunſes in the Mers. MacCaghwell, an Iriſh author, who wrote the life of this Scotus, proves him to have been born at Down in the province of Ulſter in Ireland: but Leland, Bale, Camden, and Pits, aſſure us, that he was born at Dunſtone in the pariſh of Emildune, near Alnwick in Northumberland; and this opinion is rendered probable by the following concluſion of his manuſcript works in the library of Merton college in Oxford.—"Here end the writings of that ſubtile doctor of the univerſity of Paris, John Duns, who was born in a certain village, in the pariſh of Emildune, called *Dunſton*, in the county of Northumberland." We are told, that, when a boy, he became accidentally known to two Franciſcan friars; who, finding him to be a youth of very extraordinary capacity, took him to their convent at Newcaſtle, and afterwards perſuaded him to become one of their fraternity. From thence he was ſent to Oxford, where he was made fellow of Merton college and profeſſor of divinity; and Mackenzie ſays, that not leſs than 30,000 ſtudents came to Oxford to hear his lectures. His fame was now become ſo univerſal, that the general of his order commanded him to go to Paris, that the ſtudents of that univerſity might alſo profit from his lectures. He went to Paris in the year 1304, where he was honoured firſt with the degree of bachelor, then of doctor of divinity, and in 1307 was appointed regent of the divinity ſchools: during his reſidence here, the famous controverſy about the *Immaculate conception of the virgin Mary* aroſe. Albertus Magnus maintained that ſhe was born in original ſin. Scotus advanced 200 arguments in ſupport of the contrary opinion, and convinced the univerſity of Paris that ſhe was really conceived immaculate. This important nonſenſe, however, continued to be diſputed till the year 1496, after the council of Baſil, when the univerſity of Paris made a decree, that no ſtudent, who did not believe the *immaculate conception*, ſhould be admitted to a degree. Our author had not been above a year at Paris, when the ſame general of the Franciſcans ordered him to remove to Cologne; where he was received with great pomp and ceremony by the magiſtrates and nobles of that city, and where he died of an apoplexy ſoon after his arrival, in the year 1308, in the 34th year of his age. Some writers have reported, that Scotus was buried in an epileptic fit; and that, upon removing his bones, he appeared to have turned himſelf in his coffin. This *doctor ſubtilis* was doubtleſs one of the firſt wranglers of his time, admirably well verſed in ſcholaſtic divinity, and a moſt indefatigable ſcribbler; but the misfortune is, that all his huge volumes do not contain a ſingle page worth the peruſal of a rational being. He was the author of a new ſect of ſchoolmen called *Scotiſts*; who oppoſed the opinions of the Thomiſts, ſo called from St Thomas Aquinas. The reader will find a more particular account of Scotus in the Franciſcan Martyrology, publiſhed at Paris in 1638.—He was a moſt voluminous writer; his works making 12 vols. folio, as publiſhed at Lyons by Luke Wadding, 1639.

Dunſtable
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Dunſtan.

DUNSTABLE, a town in Bedfordſhire, with a market on Wedneſdays. It is ſeated on a chalky hill; and has ponds in the ſtreets, which are never dry tho' only ſupplied with rain water. It is remarkable for ſeveral good inns, it being a great thoroughfare on the northern road. It conſiſts of four ſtreets, interſecting each other at right angles; and in the centre ſtood one of thoſe beautiful croſſes of queen Eleanor, which was deſtroyed by the enthuſiaſts in the time of the civil wars. W. Long. 0. 29. N. Lat. 51. 50.

DUNSTAFFNAGE. See LORNE.

DUNSTAN, a famous ſaint, and archbiſhop of Canterbury; of whom the monkiſh hiſtorians give us the following account. He was deſcended from a noble family in Weſſex, and educated in the abbey of Glaſtonbury. Here he ſtudied ſo hard, that it threw him into a violent fever which brought him to the very point of death. When the whole family were ſtanding about his bed, diſſolved in tears, and expecting every moment to ſee him expire, an angel came from heaven in a dreadful ſtorm, and gave him a medicine which reſtored him to perfect health in a moment. Dunſtan immediately ſtarted from his bed, and run with all his ſpeed towards the church to return thanks for his recovery; but the devil met him by the way, ſurrounded by a great multitude of black dogs, and endeavoured to obſtruct his paſſage. This would have frightened ſome boys; but it had no ſuch effect upon Dunſtan; who pronouncing a ſacred name, and brandiſhing his ſtick, put the devil and all his dogs to flight. The church-doors being ſhut, an angel took him in his arms, conveyed him through an opening in the roof, and ſet him ſoftly down on the floor, where he performed his devotions. After his recovery, he purſued his ſtudies with the greateſt ardor, and ſoon became a perfect maſter in philoſophy, divinity, muſic, painting, writing, ſculpture, working in gold, ſilver, braſs, and iron, &c. When he was ſtill very young he entered into holy orders, and was introduced by his uncle Athelm archbiſhop of Canterbury to King Athelſtan; who, charmed with his perſon and accompliſhments, retained him in his court, and employed him in many great affairs. At leiſure hours he uſed to entertain the king and his courtiers with playing on his harp, or ſome other muſical inſtrument; and now and then he wrought a miracle, which gained him great admiration. His old enemy the devil was much offended at this, and prompted ſome envious courtiers to perſuade the king that his favourite was a magician, which that prince too readily believed. Dunſtan diſcovering by the king's countenance that he had loſt his favour, and reſolving to reſign rather than be turned out, retired from court to another uncle, who was biſhop of Wincheſter. This good prelate prevailed upon his nephew to forſake the world and become a monk; after which he retired to a little cell built againſt the church-wall of Glaſtonbury. Here he ſlept, ſtudied, prayed, meditated, and ſometimes amuſed himſelf with forging ſeveral uſeful things in braſs and iron. One evening, as he was working very buſily at his forge, the devil, putting on the appearance of a man, thruſt his head in at the window of his cell, and aſked him to make ſomething or other for him. Dunſtan was ſo intent upon his work that he made no anſwer; on which the devil began to ſwear and talk obſcenely, which betrayed the lurking fiend. The holy blackſmith, putting up a ſecret ejaculation, pulled his tongs, which were red-hot, out of the fire, ſeized the devil with them by the noſe, and ſqueezed him with all his ſtrength; which made his infernal majeſty roar and ſcold at ſuch a rate, that he awakened and terrified all the people for many miles around. Thus far the legend.

Ridiculous as were theſe fictions, they ſerved, in thoſe times of ignorance, to procure Dunſtan a reputation which has been confirmed by the authority of ſeveral ſucceeding hiſtorians. It appears that this extraordinary perſon was recalled to court by king Edmund, A. D. 941; who beſtowed upon him the rich abbey of Glaſtonbury, which for his ſake he honoured with many peculiar privileges. He enjoyed a very high degree of the favour of this prince during his ſhort reign of ſix years; but he ſtood much higher in the favour of his brother and ſucceſſor king Edred, to whom he was confeſſor, chief confident, and prime miniſter. He employed all his influence during this period of court-favour in promoting the intereſt of the monks of the Benedictine order, to which he belonged, and of which he was a moſt active and zealous patron. Having the treaſures of theſe two princes, eſpecially of the laſt, very much at his command, he laviſhed them away in building and endowing monaſteries for theſe monks, becauſe almoſt all the old monaſteries were in the poſſeſſion of ſecular canons. Not contented with this, he perſuaded Edred (who was a bigotted valetudinary) to beſtow ſuch immenſe treaſures on the churches and monaſteries by his laſt will, that the crown was ſtripped of its moſt valuable poſſeſſions, and left in a ſtate of indigence. This conduct of Dunſtan, while he was in power, rendered him very odious to Edwi, who ſucceeded his uncle Edred A. D. 955; and his rude behaviour to himſelf, and his beloved queen Elgiva, raiſed the reſentment of that prince ſo high, that he deprived him of all his preferments, and drove him into exile *. The baniſhment of Dunſtan, the great patron, or (as Malmſbury calls him) the prince of monks, was a ſevere blow to that order, who were expelled from ſeveral monaſteries; which were made the impure ſtables (according to the ſame author) of the married clergy. But their ſufferings were not of long continuance. For Edgar, the younger brother of Edwi, having raiſed a ſucceſsful rebellion againſt his unhappy brother, and uſurped all his dominions on the north ſide of the river Thames, recalled Dunſtan, and gave him the biſhopric of Worceſter, A. D. 957. From this moment he was the chief confident and prime miniſter of king Edgar, who became ſole monarch of England A. D. 959, by the death of his elder brother Edwi. In the following year Dunſtan was raiſed to be archbiſhop of Canterbury; and being thus poſſeſſed of the primacy, and aſſured of the royal ſupport and aſſiſtance, he prepared to execute the grand deſign which he had long meditated, of compelling the ſecular canons to put away their wives and become monks; or of driving them out and introducing Benedictine monks in their room. With this view he procured the promotion of Oſwald to the ſee of Worceſter, and of Ethelwald to that of Wincheſter; two prelates who were monks themſelves, and animated with the moſt ardent zeal for the advancement of their order. And theſe three great champions of the order found means, by their arts and intrigues, in the courſe of a few years, to fill no fewer than 48 monaſteries with Benedictines. But on the death of Edgar in 975 they received a check. The ſufferings of the perſecuted canons had excited much compaſſion; and many of the nobility, who had been overawed by the power and zeal of the late king, now eſpouſed their cauſe and promoted their reſtoration. Elferc Duke of Mercia drove the monks by force out of all the monaſteries in that extenſive province, and brought back the canons, with their wives and children; while Elfwin Duke of Eaſt Anglia, and Brithnot Duke of Eſſex, raiſed their troops to protect the monks in theſe countries. To allay theſe commotions, ſeveral councils were held: in which Dunſtan was ſo hard puſhed by the ſecular canons and their friends, that he was obliged to practiſe ſome of his holy ſtratagems; and finally, by dint of miracles, overcame all oppoſition *.

St Dunſtan died A. D. 988, in the 64th year of his age, having held the biſhopric of London, together with the archbiſhopric of Canterbury, about 27 years. As this prelate was the great reſtorer and promoter of the monaſtic inſtitutions, the grateful monks, who were almoſt the only hiſtorians of thoſe dark ages, have loaded him with the moſt extravagant praiſes, and repreſented him as the greateſt wonder-worker and higheſt favourite of heaven that ever lived. To ſay nothing of his many conflicts with the devil, in which he often belaboured that enemy of mankind moſt ſeverely, the following ſhort ſtory, which is told with great exultation by his biographer Oſbern, will give the reader ſome idea of the aſtoniſhing impiety and impudence of thoſe monks, and of the no leſs aſtoniſhing blindneſs and credulity of thoſe unhappy times. "The moſt admirable, the moſt ineſtimable Father Dunſtan (ſays that author), whoſe perfections exceeded all human imagination, was admitted to behold the mother of God and his own mother in eternal glory: for before his death he was carried up into heaven, to be preſent at the nuptials of his own mother with the Eternal King, which were celebrated by the angels with the moſt ſweet and joyous ſongs. When the angels reproached him for his ſilence on this great occaſion, ſo honourable to his mother, he excuſed himſelf on account of his being unacquainted with thoſe ſweet and heavenly ſtrains; but being a little inſtructed by the angels, he broke out into this melodious ſong, O King and Ruler of nations," &c. It is unneceſſary to make any comment on this moſt ſhocking ſtory.

The violent and too ſucceſsful zeal of Dunſtan and his aſſociates, in promoting the building and endowing ſo great a number of houſes for the entertainment of uſeleſs monks and nuns, was very fatal to their country: for by this means a ſpirit of irrational unmanly ſuperſtition was diffuſed amongſt the people, which debaſed their minds and diverted them from nobler purſuits; and a very great proportion of the lands of England being put into hands who contributed nothing

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* See England, n° 57.

* See England, n° 64.

thing to its defence, rendered it an eaſy prey, firſt to the inſulting Danes, and afterwards to the victorious Normans.

DUNUM, a Celtic term, denoting a hill or eminence, and which often concurs to form the names of towns, to ſignify their high ſituation, places of ſtrength or citadels, hills or eminences, being adapted to ſuch ſtructures. See Dun.

Dunum (Ptolemy), a town of Ireland; now thought to be *Down* or *Down-Patrick*, in the county of Down. W. Long. 5. 57. N. Lat. 54. 23.

DUO, in muſic, a ſong or compoſition, to be performed on two parts only, one ſung, the other played on an inſtrument, or by two voices.

Duo is alſo when two voices ſing different parts, as accompanied with a third, which is a thorough baſs. It is ſeldom that uniſons and octaves are uſed in duos, except at the beginning and end.

DUODECIMA, in muſic, is the twelfth or the fifth doubled.

DUODENUM. See Anatomy, p. 727.

DUPIN (Lewis Ellis), a learned doctor of the Sorbonne, and one of the greateſt critics of his time, eſpecially in eccleſiaſtical matters, was born at Paris in 1657. When he publiſhed the firſt volume of his *Bibliotheque Univerſelle des Auteurs Eccleſiaſtiques*, in 1686, the liberty with which he treated ſome eccleſiaſtical writers, gave ſuch offence, that M. de Harlay, archbiſhop of Paris, obliged Dupin to retract many propoſitions, and ſuppreſſed the work. He was nevertheleſs ſuffered to continue it, by altering the title from *Bibliotheque Univerſelle*, to *Bibliotheque Nouvelle*. This great undertaking continued in ſeveral ſucceſſive volumes, though ſufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with ſeveral other works. He was a man of prodigious reading; and had an eaſy happy way of writing, with an uncommon talent at analyſing the works of an author; which makes his Eccleſiaſtical Bibliotheque ſo valuable. M. Dupin was profeſſor of philoſophy in the royal college; but was baniſhed ſome time from the chair to Chatelleraut, on account of the famous *Cas de Conſcience;* but was reſtored, and died in 1719.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

Sub-Duple Ratio, is juſt the reverſe of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is alſo uſed for the ſecond letters-patent, granted by the lord chancellor in a caſe wherein he had before done the ſame. Alſo a ſecond letter written and ſent to the ſame party and purpoſe as a former, for fear of the firſt's miſcarrying, is called a *duplicate*.

Duplicate Proportion or *Ratio*. See Ratio.

DUPLICATION, in general, ſignifies the doubling of any thing, or multiplying of it by 2: alſo the folding of any thing back again on itſelf.

DUPLICATURE, among anatomiſts, a term uſed to denote the folds of any membrane or veſſel: thus we ſay, the *duplicatures of the inteſtines, peritonæum*, &c.

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two aſſes. See As.

As the as at firſt weighed a juſt pondo or libra, the dupondius then weighed two; and hence the name.

And though the weight of the as was afterwards diminiſhed, and of conſequence that of the dupondius alſo, yet they ſtill retained the denomination. See Pound and Libra.

DUPPA (Brian), a learned Engliſh biſhop born in 1589 at Lewiſham in Kent, of which place his father was then vicar. In 1634, he was inſtituted chancellor of the church at Sarum, and ſoon after made chaplain to Charles I. He was appointed tutor to Charles prince of Wales, and his brother James duke of York; was made biſhop of Chicheſter; and in 1641 tranſlated to Saliſbury, though the confuſions that followed deprived him of all benefit from his promotion. Charles I. held him in high eſteem, and he is ſaid to have aſſiſted the king in compoſing the *Eikon Baſilike*. On the Reſtoration he was made biſhop of Wincheſter, and lord high almoner; but died in 1662. He bequeathed large ſums to charitable purpoſes: and publiſhed a few ſermons, with other religious pieces.

DURANDUS (William), born at Puimoiſſon in Provence, in the 13th century, was one of the moſt knowing lawyers of his time. Pope Martin made him one of his nuncios, and then biſhop of Mende and Languedoc. His *Speculum Juris* gave him the name of *Speculator;* his ſecond piece was *Rationale divinorum officiorum*, containing eight books. He wrote ſeveral others.

DURANTA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquefid, ſuperior; the berry tetraſpermous; the ſeeds bilocular.

DURATION, an idea we get by attending to the fleeting and perpetual periſhing parts of ſucceſſion. See Metaphysics.

Duration, as marked by certain periods and meaſures, is what we moſt properly call *time*. See Time.

Duration of Action, according to Ariſtotle, is confined to a natural day in tragedy; but the epopea, according to the ſame critic, has no fixed time. See Poetry.

DURER (Albert), deſcended of an Hungarian family, and born at Nuremberg in 1471, was one of the beſt engravers and painters of his age. He was at the ſame time a man of letters and a philoſopher; and he was an intimate friend of Eraſmus, who reviſed ſome of the pieces which he publiſhed. He was a man of buſineſs alſo, and for many years the leading magiſtrate of Nuremberg. Though not the inventor, he was one of the firſt improvers of the art of engraving; and he bethought himſelf of working alſo in wood, for expedition, having an inexhauſtible fund of deſigns. In many of thoſe prints which he executed on copper, the engraving is elegant to a great degree. His *Hell-Scene* particularly, which was engraved in the year 1513, is as highly finiſhed a print as ever was engraved, and as happily executed. In his wooden prints too we are ſurpriſed to ſee ſo much meaning in ſo early a maſter; the heads ſo well marked, and every part ſo well executed.—This artiſt ſeems to have underſtood the principles of deſign. His compoſition, too, is often pleaſing; and his drawing generally good. But he knows very little of the management of light; and ſtill leſs of grace: and yet his ideas are purer and more elegant than we could have ſuppoſed from the aukward archetypes which his country and education afforded. In a word, he was certainly a man of a very extenſive genius; and, as Vaſari remarks, would have been an extraordinary artiſt, if he had had an Italian inſtead of a German education. His prints are very numerous. They were much admired in his own life-time, and eagerly bought up; which put his wife, who was a teazing woman, upon urging him to ſpend more time upon engraving than he was inclined to do. He was rich; and choſe rather to practiſe his art as an amuſement than as a buſineſs. He died in the year 1527.

DURESSE, HARDSHIP, in law, is where a perſon is kept in priſon or reſtrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which caſe, if a perſon ſo in priſon, or in fear of ſuch threats, make any ſpecialty or obligation, by reaſon of ſuch impriſonment or threats, ſuch deed is void in law; and in an action brought on ſuch ſpecialty, the party may plead, that it was brought by dureſſe.

D'URFEY (Thomas), an eminent Engliſh ſatyriſt and ſongſter, whoſe name, though as well known as that of any writer extant, yet there are very few particulars of his life to be collected. He was born in Devonſhire; but when, where, or of what family, are all uncertain. He was bred to the law, which he forſook for the more agreeable employment of writing plays and ſongs; and the latter he had ſo happy a talent both of writing and ſinging, that he received many favours from perſons of quality on that account. Even crowned heads did not diſdain his company. The writer] of the Guardian, N° 67. tells us, he remembered to have ſeen Charles II. leaning on Tom D'Urfey's ſhoulder more than once, humming over a ſong with him. This indeed was not extraordinary in ſo merry a monarch; but even the phlegmatic king William could relax his muſcles on hearing him ſing. He was certainly by all accounts a cheerful, honeſt, good-natured man: but as this character does not include prudence, D'Urfey grew poor as he grew old; and prevailing on the managers of the playhouſe to act his comedy of the *Plotting Siſters* for his benefit, Mr Addiſon wrote the abovementioned paper in the Guardian, with another, N° 82. repreſenting him in a good humoured light, to procure him a full houſe. He died very old, in 1723.

DURHAM (biſhopric of), one of the counties of England. Before the arrival of the Romans it was included in the Britiſh principality of the Brigantes, and after their arrival made part of the province of Maxima Cæſarienſis. During the Heptarchy it made part of the kingdom of Northumberland, the 5th eſtabliſhed, which began in 547, and ended in 827, having been governed by 31 kings. It was not mentioned by Alfred in his diviſion of counties, being at that time conſidered as a part of Yorkſhire. At preſent it is included in the northern circuit, in the province of York; and is a dioceſe and principality under the government of its own biſhop, being a county palatine, the ſecond in rank, and the richeſt in England. It is bounded on the north by Northumberland, on the ſouth by Yorkſhire, on the eaſt by the North Sea, and on the weſt by Cumberland. It is 39 miles long, 35 broad, and 107 in circumference; containing 410,000 ſquare acres, or 758 ſquare miles; with 97,000 inhabitants, 80 pariſhes, 21 vicarages, one city (Durham), and 9 market-towns, *viz.* Stockton, Sunderland, Barnard-Caſtle, Darlington, Stanhope, Hartlepool, Aukland, Staindrop, and Marwood; beſides 223 villages. It is divided into 4 wards, ſends 4 members to parliament, pays three portions of the land-tax, and provides 400 of the national militia. It has 21 parks, 4 caſtles, and 20 bridges, with the rivers Tees, Tine, Were, Tame, Lune, Darwent, Gauntleſs, Skern, &c. The Lune and Teeſdale foreſts. Its principal products are lead, coals, iron, corn, muſtard, ſalt, glaſs, fine ale, with excellent butter and ſalmon. The ſoil is various; the ſouth is rich, but the weſtern parts rocky and mooriſh.

Durham, as already obſerved, is a county palatine, governed by the biſhop, who had formerly great prerogatives. He had power to create barons, appoint judges, convoke parliaments, raiſe taxes, and coin money. The courts of juſtice were kept in his name; and he granted pardons for treſpaſſes, alienations, rapes, murders, and felonies of every denomination. He erected corporations, granted markets and fairs, created officers by patent, was lord admiral of the ſeas and waters within the county palatine: great part of the lands were held of the ſee *in capite*. In a word, he exerciſed all the power and juriſdiction of a ſovereign prince. How and at what period theſe prerogatives were obtained, it is not eaſy to determine. Malmſbury ſays, the lands were granted by king Alfred, who likewiſe made the church a ſanctuary for criminals. This ſee was anciently called the *patrimony of St Cuthbert*, who had been biſhop of Landisfarne or Holy Iſland near Berwick. His bones being transferred to Durham, were long eſteemed as precious relics; and the people of the county conſidered themſelves as Halwerk men, exempted from all other but holy work, that is, the defence of St Cuthbert's body. Certain it is, they pretended to hold their lands by this tenure; and refuſed to ſerve out of the county either for the king or biſhop: but king Edward I. broke through theſe privileges, and curtailed the prerogatives of the biſhops, which were ſtill further abridged by Henry VIII. Nevertheleſs, the biſhop is ſtill earl of Sadberg, a place in this county which he holds by barony. He is ſheriff paramount; and appoints his own deputy, who makes up his audit to him, inſtead of accounting to the exchequer. He has all the forfeitures upon outlawries: and he and his temporal chancellor act as juſtices of the peace for the county palatine, which comprehends Creke in Yorkſhire, Bedlington, Northam, and Holy Iſland, in Northumberland, the inhabitants of theſe places having the benefit of the courts at Durham. The judges of aſſize, and all the officers of the court, have ſtill their ancient ſalaries from the biſhop; and he conſtitutes the ſtanding officers by his letters patent. He has the power of preſiding in perſon in any of the courts of judicature. Even when judgment of blood is given, this prelate may ſit in court in his purple robes, though the canons forbid any clergyman to be preſent in ſuch caſes: hence the old ſaying, *Solum Dunelmenſe ſtola jus dicet et enſe.* It was not till the reign of Charles II. that the biſhopric ſent repreſentatives to parliament.

DURHAM, the capital of the above mentioned county, is ſituated in W. Long. 1. 14. N. Lat. 54. 50. It ſtands on a hill almoſt ſurrounded by the river Were; and is conſiderable for its extent and the number of its inhabitants, as well as for being the ſee and ſeat of the biſhop, who is lord paramount. It ſtands about 280 miles north from London; being remarkable for the ſalubrity of its air, and the abundance and cheapneſs of its proviſions. Theſe circumſtances have induced a great deal of good company to take up their reſidence at Durham, which is ſtill further animated by the preſence and court of the biſhop and his clergy. The town is ſaid to have been built about 70 years before the Norman conqueſt, on occaſion of bringing hither the body of St Cuthbert. It was firſt incorporated by king Richard I. but queen Elizabeth extended its privileges. At length, in the year 1684, it obtained a charter; in conſequence of which, it is now governed by a mayor, 12 aldermen, 12 common council men, with a recorder, and inferior officers. Theſe can hold a court-leet and court-baron within the city; but under the ſtyle of the biſhop, who as count palatine appoints a judge, ſteward, ſheriffs, and other inferior magiſtrates. The mayor and aldermen alſo keep a *pie poudres* court at their fairs, and pay a yearly toll to the biſhop. They have a weekly market on Saturday, and three annual fairs. Durham is about a mile in length, and as much in breadth, reſembling the figure of a crab, the market-place exhibiting the body, and the claws being repreſented by the ſtreets, which bend according to the courſe of the river, that almoſt ſurrounds one part of the city. They are, moreover, dark and narrow; and ſome of them lying on the acclivity of a ſteep hill, are very difficult and dangerous to wheel-carriages. The houſes are in general ſtrong built, but neither light nor elegant. The moſt remarkable edifices are the cathedral with ſix other churches, three ſtanding in the city, and as many in the ſuburbs; the college; the caſtle, or biſhop's palace; the tolbooth near St Nicholas's church; the croſs and conduit in the market-place; with two bridges over the Elvet. The cathedral was begun by biſhop Carilepho in the 11th century. It is a large, magnificent, Gothic ſtructure, 411 feet long, and 80 in breadth, having a croſs aile in the middle 170 feet in length, and two ſmaller ailes at each end. On the ſouth-ſide is a fine cloiſter; on the eaſt, the old library, the chapter-houſe, and part of the deanery; on the weſt, the dormitory, under which is the treaſury and a chantry; and on the weſt ſide is the new library, an elegant building begun by dean Sudbury about 70 years ago, on the ſpot where ſtood the old refectory of the convent. The middle tower of the cathedral is 212 feet high. The whole building is arched and ſupported by huge pillars. Several of the windows are curiouſly painted; and there is a handſome ſcreen at the entrance into the choir. Sixteen biſhops are interred in the chapter-houſe, which is 75 feet long and 33 broad, arched over-head, with a magnificent ſeat at the upper end for the inſtalment of the biſhops. The conſiſtory is kept in the chapel or weſt aile called *Galilee*, which was built by biſhop Pudſey, and had formerly 16 altars for women, as they were not allowed to advance farther than the line of marble by the ſide of the font; here likewiſe are depoſited the bones of the venerable Bede, whoſe elogium is written on an old parchment ſcroll that hangs over his tomb. The long croſs aile, at the extremity of the church, was formerly diſtinguiſhed by nine altars, four to the north, and four to the ſouth, and the moſt magnificent in the middle dedicated to the patron St Cuthbert, whoſe rich ſhrine was in this quarter, formerly much frequented by pilgrims. The church is poſſeſſed of ſome old records relating to the affairs of Scotland, the kings of which were great benefactors to this cathedral. The ornaments here uſed for adminiſtering the divine offices, are ſaid to be richer than thoſe of any other cathedral in England. Before the reformation, it was diſtinguiſhed by the name *Eccleſia ſanctæ Mariæ et ſancti Cuthberti*; but it obtained the appellation of *Eecleſia cathedralis Chriſti et beatæ Mariæ*, in the reign of Henry VIII. who endowed the deanery with 12 prebendaries, 12 minor canons, a deacon, ſub-deacon, 16 lay ſinging men, a ſchoolmaſter and uſher, a maſter of the choir, a divinity reader, eight alms-men, 18 ſcholars, 10 choiriſters, two vergers, two porters, two cooks, two butlers, and two ſacriſtans. On the ſouth-ſide of the cathedral is the college; a ſpacious court formed by the houſes of the prebendaries, who are richly endowed and extremely well lodged. Above the college-gate, at the eaſt end, is the exchequer; and at the weſt, a large hall for entertaining ſtrangers, with the granary and other offices of the convent. The college-ſchool, with the maſter's houſe, ſtands on the north ſide of the cathedral. Between the churchyard and caſtle, is an open area called the *palace green*: at the weſt end of which ſtands the ſhire-hall, where the aſſizes and ſeſſions are held for the county. Hard by is the library built by biſhop Coſin; together with the exchequer raiſed by biſhop Nevil, in which are kept the offices belonging to the county-palatine court. There is an hoſpital on the eaſt, endowed by biſhop Coſin, and at each end of it are two ſchools founded by biſhop Langley. On the north, is the caſtle built by William the Conqueror, and afterwards converted into the biſhop's palace, the outward gate of which is at preſent the county-goal.

The city conſiſts of three manors; the biſhop's manor, containing the city liberties and the bailey, held of him by the ſervice of caſtle-guard; the manor of the dean and chapter, conſiſting of the Elvet's croſs gate, ſouth-gate ſtreet; and the manor of Gilligate, formerly belonging to the diſſolved hoſpital of Kepyar in this neighbourhood, but granted by Edward VI. to John Cockburn, lord of Ormiſtoun, and late in the poſſeſſion of John Tempeſt, Eſq.

The biſhopric of Durham is deemed the richeſt biſhopric in the kingdom; and the prebends are frequently ſtyled the Golden Prebends of Durham. The dioceſe contains the whole counties of Durham and Northumberland, except the juriſdiction of Hexham in the latter. It hath alſo one pariſh in the county of Cumberland: making in the whole 135 pariſhes, whereof 87 are impropriate. The ſee is valued in the king's books at L. 2821 : 1 : 5½, but is computed to be worth annually L. 8700. The clergy's tenths amount to L. 385 : 5 : 6½. It has two archdeacons, viz. of Durham and Northumberland. This ſee hath given to the church of Rome eight ſaints and one cardinal; and to the Engliſh nation one lord chief juſtice, five lord chancellors, three lord treaſurers, one principal ſecretary of ſtate, one chancellor to the univerſity of Oxford, and two maſters of the rolls.

In the neighbourhood of this city is Nevil's croſs, famous for the battle fought in the year 1346, againſt David II. king of Scotland, who was defeated and taken.

DURIO, in botany: A genus of the polyandria order, belonging to the polyadelphia claſs of plants. The calyx is a monophyllous perianthium; the corolla has five petals growing to the calyx; the ſtamina are conjoined in five bodies; the germ is roundiſh; the ſtyle briſtly, the length of the ſtamina. The fruit is a roundiſh apple every where muricated; the ſeeds have a mucous orilla.

DURNIUM, or Durnovaria, a town of the Durotriges in Britain. Now *Dorcheſter*, the capital of Dorſetſhire, on the Frome.

DUROBRIVÆ (anc. geog.), a town of the Catyeuchlani in Britain. Now in ruins, which lie on the Nen, between Caſter and Dornford, in Northamptonſhire, on the borders of Huntingdon.

Durobrivæ, or *Durocobrivæ*, a town of the Trinobantes, in Britain; whoſe ruins are ſituated between Flamſtead and Redburn, in Hertfordſhire.

DUROBRIVIS, 25 miles to the weſt of Durovernum, or Canterbury; from which it appears to be Rocheſter town, confirmed by the charter of foundation of the church, in which it is called *Durobrevis*.

DUROCASES, Durocassium, Durocassæ, and Durocasses, a town of the Carnutes, in Gallia Celtica; now Dreux. See Druidæ.

DUROCORNOVIUM (anc. geog.), a town of Britain; now *Cirenceſter*, in Glouceſterſhire (Camden), Called *Corinium* by Ptolemy.

DUROCORTORUM, or Duricortorum, a town of the Rhemi in Belgica; now *Rheims* in Champaign. E. Long. 4. N. Lat. 49. 20.

DUROIA, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants. The calyx above is cylindrical and loped; the border ſix-parted; there are no filaments; the fruit a hiſpid apple.

DUROLENUM, a town of the Cantii in Britain; now *Lenham*, in Kent (Camden); *Charing* (Talbot).

DUROLITUM, a town of the Trinobantes; now *Leiton*, on the Ley, in Eſſex (Camden).

DUROTRIGES, an ancient Britiſh nation, ſeated in that part of the country which is now called *Dorſetſhire*. Their name is derived from the two Britiſh words *Dur* "water," and *Trigo* "to dwell;" and it is no leſs evident that they got their name from the ſituation of their country, which lies along the ſea-coaſt. It is not very certain whether the Durotriges formed an independent ſtate under a prince of their own, or were united with their neighbours the Dammonii; as they were reduced by Veſpaſian under the dominion of the Romans, at the ſame time, and with the ſame eaſe, and never revolted. The peaceable diſpoſition of the inhabitants was probably the reaſon that the Romans had ſo few towns, forts, and garriſons, in this pleaſant country. Dorcheſter, its preſent capital, ſeems to have been a Roman city of ſome conſideration, though our antiquaries are not agreed about its Roman name. It is moſt probable that it was the Durnovaria in the 12th Iter of Antoninus. Many Roman coins have been found at Dorcheſter; the military way, called *Jcening-Street*, paſſed through it; and ſome veſtiges of the ancient ſtone wall with which it was ſurrounded, and of the amphitheatre with which it was adorned, are ſtill viſible. The country of the Durotriges was included in the Roman province called *Flavia Cæſarienſis*, and governed by the preſident of that province, as long as the Romans kept any footing in theſe parts.

DURY (John), a Scots divine, who travelled much, and laboured with great zeal to reunite the Lutherans with the Calviniſts. His diſcouragements in this ſcheme ſtarted another ſtill more impracticable; and this was to reunite all Chriſtians by means of a new explication of the Apocalypſe, which he publiſhed at Francfort in 1675. He enjoyed then a comfortable retreat in the country of Heſſe; but the time of his death is unknown: his letter to Peter du Moulin concerning the ſtate of the churches of England, Scotland, and Ireland, was printed at London in 1658, by the care of du Moulin, and is eſteemed to be curious.

DUSSELDORP, a city of Weſtphalia in Germany, and capital of the duchy of Berg. It is ſituated at the conflux of the river Duſſel with the Rhine, in E. Long. 6. 20. N. Lat. 51. 15.

DUTCHY. See Duchy.

DUTY, in general, denotes any thing that one is obliged to perform.

Duty, in a moral ſenſe. See *Moral Philoſophy*.

Duty, in polity and commerce, ſignifies the impoſt laid on merchandizes, at importation or exportation, commonly called the duties of cuſtoms; alſo the taxes of exciſe, ſtamp-duties, &c. See Customs, Excise, &c.

The principle on which all duties and cuſtoms ſhould be laid on foreign merchandizes which are imported into theſe kingdoms, are ſuch as tend to cement a mutual friendſhip and traffic between one nation and another; and therefore due care ſhould be taken in the laying of them, that they may anſwer ſo good an end, and be reciprocal in both countries: they ſhould be ſo laid as to make the exports of this nation at leaſt equal to our imports from thoſe nations wherewith we trade, ſo that a balance in money ſhould not be iſſued out of Great Britain, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers ſhould be deprived of their revenues ariſing from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to ſuch countries. Theſe are the national principles on which all our treaties of commerce with other countries ought to be grounded.

Duty, in the military art, is the exerciſe of thoſe functions that belong to a ſoldier: with this diſtinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on ſervice.

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate laſted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magiſtrates, commiſſioners, and officers, where two were joined together in the ſame functions.

Duumviri Capitales were the judges in criminal cauſes: from their ſentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. Theſe judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

Duumviri Municipales, were two magiſtrates in ſome cities of the empire, anſwering to what the conſuls were at Rome: they were choſen out of the body of the decuriones; their office laſted commonly five years, upon which account they were frequently termed *quinquinales magiſtratus*. Their juriſdiction was of great extent: they had officers who walked before them, carrying a ſmall ſwitch in their hands; and ſome of them aſſumed the privilege of having lictors, carrying axes and the faſces, or bundles of rods, before them.

Duumviri Navales, were the commiſſaries of the fleet, firſt created at the requeſt of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office conſiſted in giving orders for the fitting of ſhips, and giving their commiſſions to the marine officers, &c.

Duumviri Sacrorum, were magiſtrates created by Tarquinius Superbus, for the performance of the ſacrifices, and keeping of the ſibyls books. They were choſen from among the patricians, and held their office for life: they were exempted from ſerving in the wars, and from the offices impoſed on the other citizens, and without them the oracles of the ſibyls could not be conſulted.

DUYVELAND, or Diveland, one of the iſlands of Zealand, in the United Provinces, lying eaſtward of Schonen, from which it is only ſeparated by a narrow channel.

DWAL, in heraldry, the herb nightſhade, uſed by ſuch as blazon with flowers and herbs, inſtead of metals and colours, for ſable or black.

DWARF, in general, an appellation given to things greatly inferior in ſize to that which is uſual in their ſeveral kinds: thus there are dwarfs of the human ſpecies, dwarf-dogs, dwarf-trees, &c.

The Romans were paſſionately fond of dwarfs, whom they called *nani* or *nanæ*, inſomuch that they often uſed artificial methods to prevent the growth of boys deſigned for dwarfs, by incloſing them in boxes, or by the uſe of tight bandages. Auguſtus's niece, Julia, was extremely fond of a dwarf called *Sonopas*, who was only two feet and an hand-breadth high.—We have many other accounts of human dwarfs, but moſt of them deformed in ſome way or other beſides the ſmallneſs of their ſize. Many relations alſo concerning dwarfs we muſt neceſſarily look upon to be fabulous, as well as thoſe concerning giants.—The following hiſtory, however, which we have reaſon to look upon as authentic, is too remarkable not to be acceptable to the generality of our readers.

Jeffery Hudſon, the famous Engliſh dwarf, was born at Oakham in Rutlandſhire in 1619; and about the age of ſeven or eight, being then but 18 inches high, was retained in the ſervice of the duke of Buckingham, who reſided at Burleigh on the Hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was ſerved up to table in a cold pye, and preſented by the ducheſs to the queen, who kept him as her dwarf. From 7 years of age till 30, he never grew taller; but after 30, he ſhot up to three feet nine inches, and there fixed. Jeffery became a conſiderable part of the entertainment of the court. Sir William Davenant wrote a poem called *Jeffreidos*, on a battle between him and a turkey-cock; and in 1638, was publiſhed a very ſmall book, called the *New Year's Gift*, preſented at court by the lady Parvula to the lord Minimus (commonly called *Little Jeffery*) her majeſty's ſervant, &c. written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negociation of great importance: he was ſent to France to fetch a midwife for the queen; and on his return with this gentlewoman, and her majeſty's dancing-maſter, and many rich preſents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of conſequence, grew to think himſelf really ſo. He had borne with little temper the teazing of the courtiers and domeſtics, and had many ſquabbles with the king's gigantic porter. At laſt, being provoked by Mr Crofts, a young gentleman of family, a challenge enſued: and Mr Crofts coming to the rendezvous armed only with a ſquirt, the little creature was ſo enraged, that a real duel enſued; and the appointment being on horſeback with piſtols, to put them more on a level, Jeffery, with the firſt fire, ſhot his antagoniſt dead. This happened in France, whither he had attended his miſtreſs in the troubles. He was again taken priſoner by a Turkiſh rover, and ſold into Barbary. He probably did not remain long in ſlavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Reſtoration. At laſt, upon ſuſpicion of his being privy to the Popiſh plot, he was taken up in 1682, and confined in the Gatehouſe, Weſtminſter, where he ended his life, in the 63d year of his age.

In the Memoirs of the Royal Academy of Sciences, a relation is given by the Count de Treſſan, of a dwarf called *Bebe*, kept by the late Staniſlaus king of Poland, and who died in 1764 at the age of 23, when he meaſured only 33 inches. At the time of his birth, he meaſured only between eight and nine inches. Diminutive as were his dimenſions, his reaſoning faculties were not leſs ſcanty; appearing indeed not to have been ſuperior to thoſe of a well-taught pointer: but that the ſize and ſtrength of the intellectual powers are not affected by the diminutiveneſs or tenuity of the corporeal organs, is evident from a ſtill more ſtriking inſtance of littleneſs, given us by the ſame nobleman, in the perſon of Monſieur Borulawſki, a Poliſh gentleman, whom he ſaw at Luneville, who has ſince been at Paris, and who at the age of 22 meaſured only 28 inches. This miniature of a man, conſidering him only as to his bodily dimenſions, appears a giant with regard to his mental powers and attainments. He is deſcribed by the count as poſſeſſing all the graces of wit, united with a ſound judgment and an excellent memory; ſo that we may with juſtice ſay of M. Borulawſki, in the words of Seneca, and nearly in the order in which he has uſed them, "*Poſſe ingenium fortiſſimum ac beatiſſimum ſub quolibet corpuſculo latere.*" Epiſt. 66.

Count Borulawſki was the ſon of a Poliſh nobleman attached to the fortunes of king Staniſlaus, who loſt his property in conſequence of that attachment, and who had ſix children, three dwarfs, and three well-grown. What is ſingular enough, they were born alternately, a big one and a little one, though both parents were of the common ſize. The little count's youngeſt ſiſter was much leſs than him, but died at the age of 23. The count continued to grow till he was about 30, and has at preſent attained his 51ſt year, and the height of three feet two inches. He never experienced any ſickneſs, but lived in a polite and affluent manner under the patronage of a lady, a friend of the family, till love at the age of 41 intruded into his little peaceful boſom, and involved him in matrimony, care, and perplexity. The lady he choſe was of his own country, but of French extraction, and the middle ſize. They have three children, all girls, and none of them likely to be dwarfs. To provide for a family now became an object big with difficulty, requiring all the exertion of his powers (which could promiſe but little) and his talents, of which muſic alone afforded any view of profit. He plays extremely well upon the guittar: and by having concerts in ſeveral of the principal cities in Germany, he raiſed temporary ſupplies. At Vienna he was perſuaded to turn his thoughts to England, where it was believed the public curioſity might in a little time benefit him ſufficiently to enable him to live independent in ſo cheap a country as Poland. He was furniſhed by very reſpectable friends with recommendations to ſeveral of the moſt diſtinguiſhed characters in this kingdom, as the ducheſs of Devonſhire, Rutland, &c. &c. whoſe kind patronage he is not backward to acknowledge. He was adviſed to let himſelf be ſeen as a curioſity, and the price of admiſſion was fixed at a guinea. The number of his viſitors, of courſe, was not very great. After a pretty long ſtay in London he went to Bath and Briſtol; viſited Dublin and ſome other parts of Ireland; whence he returned by way of Liverpool, Mancheſter, and Birmingham, to London. He alſo viſited Edinburgh and ſome other towns of Scotland. In every place he acquired a number of friends. In reality, the eaſe and politeneſs of his manners and addreſs pleaſe no leſs than the diminutive, yet elegant, proportions of his figure aſtoniſh thoſe who viſit him. His perſon is pleaſing and graceful, and his look manly and noble. He ſpeaks French fluently, and Engliſh tolerably. He is remarkably lively and cheerful, though fitted for the moſt ſerious and rational converſation. Such is this wonderful little man—an object of curioſity really worthy the attention of the philoſopher, the man of taſte, and the anatomiſt. His life has been publiſhed, written by himſelf.

DWINA, the name of two large rivers; one of which riſes in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga: the other gives name to the province of Dwina in Ruſſia, diſcharging itſelf into the White Sea a little below Archangel.

DYCK. See VANDYCK.

DYE, in architecture, any ſquare body, as the trunk or notched part of a pedeſtal: or it is the middle of the pedeſtal, or that part included between the baſe and the corniche; ſo called becauſe it is often made in the form of a cube or dye. See ARCHITECTURE, nº 61.

DYER, a perſon who profeſſes the art of dyeing all manner of colours. See DYEING.

DYER (Sir James), an eminent Engliſh lawyer, chief judge of the court of common pleas in the reign of Queen Elizabeth. He died in 1581; and about 20 years after was publiſhed his large collection of Reports, which have been highly eſteemed for their ſuccinctneſs and ſolidity. He alſo left other writings behind him relative to his profeſſion.

DYER (John), the ſon of Robert Dyer, Eſq; a Welſh ſolicitor of great capacity, was born in 1700. He paſſed through Weſtminſter-ſchool under the care of Dr Freind, and was then called home to be inſtructed in his father's profeſſion. His genius, however, led him a different way; for beſides his early taſte for poetry, having a paſſion no leſs ſtrong for the arts of deſign, he determined to make painting his profeſſion. With this view, having ſtudied a while under his maſter, he became, as he tells his friend, an itinerant painter, and wandered about South Wales and the parts adjacent; and about 1727 printed Grongar Hill. Being probably unſatisfied with his own proficiency, he made the tour of Italy; where, beſides the uſual ſtudy of the remains of antiquity, and the works of the great maſters, he frequently ſpent whole days in the country about Rome and Florence, ſketching thoſe pictureſque proſpects with facility and ſpirit. Images from hence naturally transferred themſelves into his poetical compoſitions: the principal beauties of The Ruins of Rome are perhaps of this kind; and the various landſcapes in The Fleece have been particularly admired. On his return to England, he publiſhed The Ruins of Rome, 1740; but ſoon found that he could not reliſh a town-life, nor ſubmit to the aſſiduity required in his profeſſion. As his turn of mind was rather ſerious, and his conduct and behaviour always irreproachable, he was adviſed by his friends to enter into holy orders; and it is preſumed, though his education had not been regular, that he found no difficulty in obtaining them. He was ordained by the biſhop of Lincoln, and had a law degree conferred on him.

About the ſame time he married a lady of Coleſhill named Enſor; "whoſe grandmother (ſays he) was a Shakeſpeare, deſcended from a brother of every body's Shakeſpeare." His eccleſiaſtical proviſion was a long time but ſlender. His firſt patron, Mr Harper, gave him, in 1741, Calthorp in Leiceſterſhire, of 80 l. a-year, on which he lived ten years; and in April 1757 exchanged it for Belchford in Lincolnſhire, of 75 l. which was given him by lord chancellor Hardwicke, on the recommendation of a friend to virtue and the muſes. His condition now began to mend. In 1752, Sir John Heathcote gave him Coningſby, of 140 l. a-year; and in 1756, when he was LL. B. without any ſolicitation of his own, obtained for him from the chancellor Kirby

Dyer. on Bane, of 110 l. In 1757, he publiſhed The Fleece, his greateſt poetical work; of which Dr Johnſon relates this ludicrous ſtory. Dodſley the bookſeller was one day mentioning it to a critical viſitor, with more expectation of ſucceſs than the other could eaſily admit. In the converſation the author's age was aſked; and being repreſented as advanced in life, "He will (ſaid the critic) be buried in woollen." He did not indeed long outlive that publication, nor long enjoy the increaſe of his preferments; for a conſumptive diſorder, with which he had long ſtruggled, carried him off at length in 1758.

Mr Dyer's character as a writer has been fixed by three poems, Grongar Hill, The Ruins of Rome, and The Fleece; wherein a poetical imagination perfectly original, a natural ſimplicity connected with and often productive of the true ſublime, and the warmeſt ſentiments of benevolence and virtue, have been univerſally obſerved and admired. Theſe pieces were put out ſeparately in his lifetime: but after his death, they were collected and publiſhed in one volume 8vo, 1761; with a ſhort account of himſelf prefixed.

Dyer's Weed.

Dyer's Weed, in botany. See Reseda.

DYEING,

In the utmoſt latitude of the word, may be defined, The art of tingeing cloth, ſtuff, or other matter, with a permanent colour, which penetrates the ſubſtance thereof.—It is, however, commonly reſtrained to the art of tingeing ſilk, wool, cotton, and linen, with different colours; and, as ſuch, is practiſed as a trade by thoſe who do not meddle with any of the other branches, as ſtaining of leather, &c.

1 Antiquity of the art.

The dyeing art is of great antiquity; as appears from the traces of it in the oldeſt ſacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though what leſſens the merit of it is, that it is ſaid to have owed its riſe to chance. The juices of certain fruits, leaves, &c. accidentally cruſhed, are ſuppoſed to have furniſhed the firſt hint: Pliny aſſures us, that even in his time the Gauls made uſe of no other dyes. It is added, that coloured earths and minerals, waſhed and ſoaked with rain, gave the next dyeing materials.—But purple, an animal juice found in a ſhell-fiſh called *murex**, *conchylium*, and *purpura*, ſeems from hiſtory to have been prior to any of them. This indeed was reſerved for the uſe of kings and princes; private perſons were forbidden by law to wear the leaſt ſcrap of it. The diſcovery of its tingeing quality is ſaid to have been taken from a dog, which having caught one of the purple fiſhes among the rocks, and eaten it up, ſtained his mouth and beard with the precious liquor; which ſtruck the fancy of a Tyrian nymph ſo ſtrongly, that ſhe refuſed her lover Hercules any favours till he had brought her a mantle of the ſame colour.

* See *Murex*.

Pliny ſeems to aſcribe the invention of the art of dyeing wool to the Lydians of Sardis: *Inficere lanas Sardibus Lydi;* where the word *incipere* muſt be underſtood. But a modern critic ſuſpects a falſe reading here; and, not without reaſon, for *Lydi* ſubſtitutes *Lydda*, the name of a city on the coaſt of Phenicia, where the chief mart of the purple dye was.

After the Phenicians, the Sardinians ſeem to have arrived at the greateſt perfection in the dyeing art; inſomuch that βαμμα Σαρδινιακον, *Sardinian dye*, paſſed into a proverb among the Greeks. Till the time of Alexander, we find no other ſort of dye in uſe among the Greeks but purple and ſcarlet.—It was under the ſucceſſors of that monarch that theſe people applied themſelves to the other colours; and invented, or at leaſt perfected, blue, yellow, green, &c.—For the ancient purple, it has been long loſt; but the perfection to which the moderns have carried the other colours, abundantly indemnifies them of the loſs. It is ſtill, however, greatly to be doubted whether the permanency of the modern colours at all equals that of the ancient ones; though it is certain that the former greatly exceed them in brightneſs.

Sect. I. *Theory of Dyeing*.

2 Salts the only means of fixing colours.

Before we can enter into any conſideration of the true theory of dyeing, it is neceſſary to make the following obſervation concerning the practice, namely, That ſalts are almoſt the only means we are acquainted with by which any colouring ſubſtance can be made to fix itſelf upon thoſe matters which are the common ſubjects of dyeing. A ſolution of cochineal, for inſtance, will of itſelf impart no permanent colour to a piece of woollen cloth put into it. The red colour of the cochineal will indeed ſtain the cloth while it remains immerſed in the ſolution; but as ſoon as it is taken out and waſhed, this temporary ſtain will immediately vaniſh, and the cloth become as white as before. If now the cloth is dipped in the ſolution of any ſaline ſubſtance, alkalies alone excepted, and then immerſed in the ſolution of cochineal for ſome time, it will come out permanently coloured; nor will the colour be diſcharged even by waſhing with ſoap and water. If a quantity of ſalt is added to the ſolution of cochineal, and the cloth put in without being impregnated with any ſaline ſubſtance, the effect will be the ſame; the cloth will come out coloured; only in this laſt caſe, it muſt be well dried before waſhing it with ſoap, or moſt of the colour will be diſcharged.

3 They operate by coagulation.

By comparing this with what is delivered under the article *Colour-Making*, nº 13, 14. we ſhall be able to form a pretty rational theory of dyeing. It is there remarked, that a ſaline ſubſtance (ſolution of tin in aqua regia) had a ſurpriſing power of coagulating the colouring matter of certain ſolutions, ſuch as cochineal, Brazil-wood, logwood, &c. If therefore a piece of cloth is previouſly impregnated with this ſolution, and put into the colouring one, it is plain that ſome part of the colouring matter will be coagulated by the ſolution remaining in the cloth, in the very ſame manner that it would have been if a ſmall quantity of the ſaline ſolution had been poured into the other. The cloth therefore will take up a part of the colouring matter, which cannot be diſcharged but by entirely diſcharging the ſolution of tin. This, however, ſeems to unite itſelf with the cloth very firmly, ſo that ſcarce a particle of colour will be diſcharged by waſhing in plain water, or even with ſoap; nor can the whole be taken out without boiling the cloth in a ſolution of fixed alkali.

Though ſolution of tin produces this coagulation in the moſt remarkable manner, it is not to be doubted that the ſame power is poſſeſſed in ſome degree by moſt of the neutrals and imperfect ſalts. Alum poſſeſſes it very conſiderably, though not ſo much as ſolution of tin; and hence that ſalt is very much uſed in dyeing, as well as ſugar of lead, which alſo has a very ſtrong power of coagulation. The proceſs of dyeing, therefore, ſeems to be moſt analogous to that of the coagulation or curdling of milk. Before it has ſuffered this change, the milk is eaſily miſcible with water; but after it is once coagulated, the curd, or caſeous part, is very difficultly ſoluble in any liquid whatever. In like manner, the colouring matter in the ſolution of cochineal, before the cloth is put in, is eaſily ſoluble in water, and may be diffuſed through any quantity of fluid: but no ſooner is the cloth dipped in it, than the ſaline ſubſtance contained in the cloth coagulates that part of the colouring matter which lies in immediate contact with it; and as all the fluid ſucceſſively comes into contact with it, the whole of the colour is by degrees coagulated and depoſited on the cloth.

4 Hypotheſes concerning the adheſion of the colour.

To account for the ſtrong adheſion of the colour to the dyed cloth, ſeveral hypotheſes have been formed. One is, That the fibres of wool, ſilk, &c. are hollow tubes; that the colouring matter enters them; and, after being there coagulated, ſhows itſelf through the fine tranſparent ſides of the tubes.—Another conſiders theſe filaments as ſolid lengthwiſe, but having all round their ſides an infinite number of ſmall pores like the extremities of the fine abſorbing and exhaling veſſels of the human body. In theſe pores, according to the hypotheſis, the colour is lodged; and as the pores are placed exceedingly cloſe to one another, the fine threads appear to our eyes of one uniform colour.—A third is, That the fibres are ſolid, or at leaſt with reſpect to us may be conſidered as ſuch. The ſaline ſubſtance, whatever it is, that is employed to make the colour ſtrike, ſinks into the ſurface, partly corrodes and unites itſelf with it into a third kind of ſubſtance no longer ſoluble in plain water, nor even eaſily by ſoap, but which ſtill preſerves its coagulating quality. According to this hypotheſis, the dye lies entirely on the outſide of the ſtuff, and continues as long as the effect of the ſalt continues upon the fibres of the matter to be dyed.

5 M. Hellot's theory diſproved.

Concerning the truth of theſe hypotheſes, or indeed any others that can be invented, it is impoſſible to bring any deciſive proof. It ſeems, however, more probable, that the proceſs of dyeing is accompliſhed by a coagulation of the colouring matter itſelf, rather than by any agglutination of it to the fibres by means of a vitriolated tartar, as Mr Hellot ſuppoſes. According to this gentleman's theory, a vitriolated tartar is generated in every proceſs for dyeing, and proceeds from the acid of the alum and alkaline baſis of the tartar uſed in the preparations, or in ſome of the dyeing ingredients themſelves. He ſuppoſes that the pores of the ſtuff are cleanſed and enlarged by the preparatory ſalts, and by the boiling water, in ſuch a manner as to receive the colouring particles, which particles are afterwards detained by the contraction of the pores occaſioned by cold; and further, that theſe pores are lined with a ſaline cruſt of tartar or vitriolated tartar.

On this theory the tranſlator of the Chemical Dictionary has the following obſervations. “Mr Hellot has not ſhown that pure fixed alkali is incapable of producing the effects which he attributes to his tartar and vitriolated tartar; and both theſe ſalts, though they are difficult of ſolution, and require a great quantity of water for this purpoſe, will yet diſſolve at laſt; and therefore, if the colouring particles were fixed chiefly by means of theſe ſalts, they might be waſhed out by a large quantity of water; which we find to be contrary to experience.

6 Another theory.

“We ſhall find it more difficult to ſubſtitute a true theory than to refute that of Mr Hellot. Many experiments ought to be previouſly made. Nevertheleſs, it may be obſerved, That the colorific particles of moſt ſubſtances uſed in dyeing ſeem to be inſoluble in water, in ſpirit of wine, and even in alkaline lixiviums: that their diffuſion through theſe liquids is cauſed merely by their adheſion to certain gummous and reſinous particles: and that they may be diſengaged from thoſe gummy and reſinous matters, by applying a piece of ſtuff to which they have a greater adheſive power, which ſeems to be the caſe of the root-coloured and blue dyes; or by applying another ſubſtance to which theſe particles have a greater power of adheſion; ſuch as the earth of alum, in thoſe dyes where that ſalt is uſed, together with ſome other ſubſtance, as fixed or volatile alkali, capable of decompoſing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themſelves and of adhering to the ſtuffs. The ſeparation of the colouring particles from the gummy and reſinous matters is probably facilitated by the addition of acids and neutral ſalts, which may coagulate in ſome meaſure the vegetable matters, and leave the colorific particles diſengaged; ſo that they may apply themſelves to the ſtuff, or to the earths above mentioned.”

7 M. de Apligny's theory.

In a treatiſe on this ſubject by M. de Apligny, the nature of the different ſubſtances uſually ſubjected to this operation is particularly conſidered. Theſe are wool, ſilk, cotton, and linen. Wool was probably the firſt ſubſtance to which any kind of dye was applied, and which might probably have been done even in the fleece, while mankind, in their rude ſtate, wore the ſkins of animals. When ſome further progreſs in arts was made, and the method of manufacturing wool into worſted and cloth diſcovered, the dye would then be applied to it; but it was not till a conſiderable time afterwards that ſilk and cotton were known; and the art of dyeing linen is mentioned as a new invention even in the time of Pliny.

Wool, according to our author, conſiſts of tubes, which, like hair, contain a medullary ſubſtance, but throughout their length are ſieves with an infinite number of lateral pores; and in proportion to the greater or leſſer number of theſe pores, the woolly fibres are more or leſs curled. The reaſon aſſigned for this is, that “the more interruptions there are in the continuity of any body, the more flexible it will be: the fibres of the wool therefore being curled muſt have many pores, and conſequently great room for the extraneous ſubſtance which may be not only lodged in the exterior pores, but even penetrate into the whole extent of the tubes, after the medullary ſubſtance has been expelled. It is not therefore to be wondered at, if wool, being of all ſubſtances that are made into ſtuffs the moſt porous, ſhould be the moſt eaſy to dye, and imbibe the greateſt quantity of colour."

Silk, according to our author, may naturally be ſuppoſed to proceed originally from the mucilage of the mulberry leaf on which the animal feeds, and which he imagines is converted into an animal ſubſtance by a combination with volatile alkali; but which, by the evaporation of a thin oil, and part of this alkaline matter, becomes tough and hard. An example of ſomething ſimilar to this is obſerved on the leaves of the *ros ſolis*, on which there are found ſome drops, which being touched while the ſun ſhines upon it may be drawn out into fine and very white threads. The conſolidation of the ſilk is alſo promoted by a yellow ſubſtance with which the animal impregnates the thread; and this ſeems to be a concrete oil ſomething ſimilar to wax. Silk thread therefore is nothing elſe than a continued ſeries of moleculæ of this indurated gluten: but as in this deſiccation the moleculæ will remain at unequal diſtances, there will neceſſarily be inequalities, and conſequently pores in the thread; but as theſe pores are only on the ſurface of the thread without any interior concavity as in the wool, it follows, that ſilk can admit no particles into its pores, but ſuch as are extremely ſubtile and in very ſmall quantities; that even the particles admitted require a ſtronger maſtic or fixing ſubſtance than wool, ſince they are only ſuperficial, and incapable of penetrating. Hence ſilk is much more difficult to dye permanently than wool, and requires likewiſe a much greater quantity of colouring materials; two ounces and a half of cochineal being required to give the ſame ſhade to a pound of ſilk that one ounce will give to a pound of wool. For the ſame reaſon alſo the colours on ſilk are leſs permanent than on wool.

Cotton being a true vegetable ſubſtance muſt neceſſarily have its fibres hollow like wool, that the juices may circulate properly; but as theſe are a great deal finer, the cotton is therefore much more difficult to dye. The exterior and lateral pores of cotton are likewiſe filled with a kind of oil, which it is neceſſary to expel before the dye can be given.

Flax may likewiſe be ſuppoſed porous, but that its pores are much ſmaller than thoſe of any of the ſubſtances already mentioned. The detached and ſeparated fibres reſemble ſilk in ſome degree, only that, being more dry and compact, they take the dye with ſtill more difficulty than even cotton; and from the different textures of theſe ſubſtances we may reaſonably aſcribe the different ſhades which are taken by them even when the ſame dyeing ingredients are made uſe of. This holds good alſo with reſpect to ſtuffs differently manufactured, though of the ſame kind; the pores being neceſſarily contracted by certain kinds of fabrication, whence they receive a ſmaller quantity of the dye: and hence ſcarlet cloth, when cut, appears white internally, the colouring atoms being too large to penetrate it, which, however, does not happen in the ſtuffs which have been previouſly dipped in ſolution of alum.—A difference of ſhade will alſo be occaſioned by the different poſitions and delicacy of the fibres of the ſtuff; and by this alſo a difference is made in the brightneſs of the colour.

8 Of the action of lime.

With regard to the operation of thoſe ſubſtances commonly made uſe of for fixing the dye, our author remarks, that lime ſeems deſtined by the Author of nature for binding and uniting the two ſeemingly oppoſite ſubſtances of ſalts and earth. "Fire (ſays he) makes it ſoluble in water, and therefore eaſily uſed; but it again becomes indiſſoluble by the contact and influence of the air; and theſe properties render it capable of forming, when united to other bodies, an unalterable cement." We know ſeveral mixtures of this kind, of which lime is the baſis, and that in conſequence of theſe properties it confirms the ſolidity of many colours.

9 Of alum.

Alum has the property of attracting the colouring particles of the dye as well as of fixing them; and Pliny informs us that this property was known to the ancients. They made uſe of certain earths of the argillaceous kind, which they called *creta argentaria*, *ſaluniſia*, and *anularia*, to imbibe the colour from infuſions of dyeing ingredients; and they became much ſooner ſaturated with the colour than wool itſelf. There are two kinds of alum made uſe of in dyeing, viz. roch alum and Roman alum. The firſt is always uſed for blues and the colours inclining to black; but as this generally contains ſome particles of iron, the Roman alum is preferred for the more lively colours, as it contains nothing capable of tarniſhing their beauty. The colours are brightened by the whiteneſs of the earth, while its tenacity, produced by ſome kind of unctuoſity with which it is combined, makes it more ſolid; and the plaſtic quality of the earth makes it take the form of the pores in the ſubſtance to be dyed; whence a greater permanency of colour muſt neceſſarily enſue.

There are ſeveral other ſaline ſubſtances made uſe of in dyeing, particularly nitre, ſea-ſalt, ſal ammoniac, and tartar, &c. By the three firſt the red colours are always rendered more dark-coloured, while the others enliven the colour and give it an orange hue. Neutral ſalts with a metallic baſis ſerve to ſtrengthen the colour, which varies its ſhade according to the nature of the metallic ſubſtance with which it is combined. Green and blue vitriol are the moſt commonly uſed in this art.

10 Dyeing ſuppoſed to be an effect of attraction.

In explaining the theory of the art of dyeing, our author conſiders the whole as an effect of attraction; and in order to ſet forth this matter in a proper light, it is neceſſary, in the firſt place, to explain the conditions requiſite for the action of bodies upon one another in this way. Theſe conditions are, 1. That the attractive power be mutual in both. 2. That they ſhould be placed at a diſtance from each other proportioned to the force of attraction. 3. That this force be ſuperior to that by which the colouring matter is attracted by the water. Hence it is neceſſary for dyeing ſtuffs of any kind, that the dye ſhould conſiſt of ſmall particles ſuſpended in a liquid, in ſuch a manner that they may be ſeparated by a ſubſtance which has a greater affinity with theſe minute bodies than water. Some of theſe ſubſtances, however, are not attracted by the earth of alum, and theſe enter the pores of the cloth without its aſſiſtance; but in ſuch as require the aſſiſtance of alum, the particles are fixed by the power of attraction, at the ſame time that the acid of the alum is ſoftened by its combination with the principles of theſe particles; this acid having ſerved merely as a vehicle for diſtributing equally into all the pores of the ſtuff that earth which it held in a ſtate of the greateſt poſſible diviſibility.

11 Salts cannot fix the colour in conſequence of their own inſolubility.

Our author next proceeds to conteſt the theory, that ſalts, even ſuch as are the moſt inſoluble, can maintain their ſtability in the pores of the ſtuff, however inſoluble the ſalt may be in water. He obſerves that this inſolubility, however great, could not prevent a great quantity of it from being carried off by water, and conſequently the colour from being injured by the decompoſition of theſe ſalts; but fixed earth, ſuch as that of lime and alum, which from its nature obſtinately retains the phlogiſtic principles of all colours, muſt neceſſarily produce ſuch as cannot be deſtroyed but by the ſtrongeſt acids.

12 Colours depend on phlogiſton.

Colours, in the opinion of our author, depend entirely upon phlogiſton. It is well known that, by the ſimple addition of any ſalt to an oily, vegetable, and colouring ſubſtance, we may either change or totally expel its colour; becauſe any ſalt, either ſimple or compound, deſtroying the combination then ſubſiſting, a new reflection of the rays of light muſt neceſſarily take place. In ſuch ſubſtances therefore as cannot have their colour affected by any ſalt, the phlogiſton is moſt probably in the moſt perfect combination with the other principles. Were we thoroughly acquainted with this combination, we ſhould be able to make perfect compoſitions for dyeing, ſimilar to what artificial cinnabar is for painting: but though we certainly know the effects produced upon ſome kinds of oils by ſalts, and can decompoſe ſome colouring ſubſtances and ſeparate their principles, we are ſtill unacquainted with the manner in which theſe principles are combined; and therefore every effort of this kind has hitherto been found inſufficient for the purpoſe.

13 Apligny's account of the action of acids and alkalies upon colouring ſubſtances.

" As the colour (ſays our author) depends upon the ſhape or figure of the conſtituent particles of the colouring bodies, the ſhade may be varied by changing their figure, but the permanency of the colour is at the ſame time diminiſhed; becauſe it is impoſſible to produce this change without altering the principles to which they owe their permanency; and this is the caſe with cochineal. The ſhades of its colour are eaſily varied by acids and alkalies."

M. de Apligny then proceeds to account for the action of acids and alkalies upon colouring ſubſtances. Cochineal is rendered darker by alkalies, and always becomes of a deep purple on adding them; and the volatile alkali is found to be more efficacious in this reſpect than the fixed kind. Theſe ſalts he ſuppoſes to produce this effect, becauſe they are natural ſolvents of animal ſubſtances; which, however, they are incapable of diſſolving without combination, cauſing only a compoſition without the diſſipation of any principle. This combination gives a degree of denſity to the colouring particles which they had not before; and thus inclines them to black, by occaſioning a greater degree of refraction in the pencils of rays. Acids, on the other hand, eſpecially thoſe of the mineral kind, burn the oil, and abſorb the phlogiſton, which is the principle of all colours. By the violence of their action a part of the phlogiſton and volatile alkali evaporates, the colouring matter becomes more rarefied, and reflects a greater number of the rays of light; whence it neceſſarily acquires a colour nearly yellow, and even quite ſo if a proper quantity be added; this being, according to our author, of all colours the neareſt to white or tranſparency. Hence it is not cuſtomary for dyers to make any uſe of fixed alkali when cochineal is the colouring ſubſtance, as it would make too great an alteration in the conſiſtence, and, by mixing with the animal oil, form a ſoap which would render the colour miſcible in water, and conſequently of the falſe kind of dye; the oil already mixed with fixed alkali being no longer at liberty to combine with the earth of alum. But after the ſubſtance has been already dyed, the fixed alkali may then be uſed with advantage in ſome caſes; becauſe the colouring ſubſtance being already converted into what our author calls a *maſtic*, cannot be diſſolved by the menſtruum unleſs the latter be uſed in very great quantity.

Acids, according to M. de Apligny, are more deſtructive in their action than alkalies; and the oil of vitriol, formerly uſed, always containing ſome ferruginous particles, a kind of Pruſſian blue was formed, which rendered the colour purple rather than otherwiſe; and even by ſimple boiling in an iron veſſel, the ſolution of cochineal always aſſumes a purple colour. The activity of ſpirit of nitre, which has been ſubſtituted in place of oil of vitriol, is ſo great, that it has been found neceſſary to give it a baſis on which it might in part exhauſt itſelf, and, by communicating part of its phlogiſton, render it leſs greedy of the cochineal. This baſis is tin, which formerly was diſſolved by ſpirit of nitre, but now by aqua regia, which was found to diſſolve it more completely. Our author's method of uſing this ſolution, however, is not by diluting it in water, and then by dipping the ſtuffs in it previous to their being dyed. " This preparation (ſays he) would not be ſufficient; for by diluting with a great quantity of water, a part of the calx would precipitate and be reduced into particles larger than when diſſolved in acids, eſpecially if uſed alone and ſeparate from the dye; the acid in that caſe not acting on the colour with ſufficient force to enliven it. Only part of this ſolution, therefore, is added to the cochineal liquor; and the acid then abandoning the tin, and combining with the oil of the cochineal, the calx of the metal ſeizes the colouring matter as it precipitates, and, as Mr Hellot obſerves, forms a kind of lacker which inſinuates into the pores of the ſtuff, and is there retained by a gluten given by the ſtarch which was added to the dyeing liquor. Hence it is eaſy to conceive why the ſcarlet dye is much leſs ſolid than the crimſon; the lacker being much drier than the ſimple colouring particles of the cochineal, is in this ſtate nearer to the nature of the mineral colours. The oil and the animal gluten, which in the crimſon dye form with the earth of alum a *maſtic*, are deſtroyed by the acid, and the ſtarch then added is an inſufficient ſubſtitute."

The ſame thing that has here been mentioned of cochineal applies equally to gum-lac and kermes; both of which afford a ſcarlet dye. The kermes, he thinks, has the advantage of being compoſed of finer particles, which more eaſily penetrate the pores of ſilk or cotton. Silk indeed, on account of the ſmallneſs of its pores, takes up only a part of the cochineal; but it extracts the whole of the colour from the cochineal, and the colour is alſo more fixed, probably becauſe the ſhrub on which the inſect is nouriſhed communicates its aſtringency, or contains a greater quantity of oil. Cotton may likewiſe be dyed with kermes, though cochineal cannot penetrate its pores.

14 Exceptions to the general rule concerning ſalts.

But in whatever way the ſalts uſed in dyeing do act, it is certain they are capable, except in a very few inſtances, of fixing and giving a luſtre and permanency to the colour which otherwiſe could never be obtained. The exception to this general rule moſt commonly known is that of indigo. This is a fine blue fecula produced by fermentation from the leaves of the Indian plant called *anil.* It is very difficult of ſolution; however, it may be diſſolved by alkaline ſalts, concentrated oil of vitriol, orpiment, or combinations of ſulphur with quicklime. If a quantity of indigo is diſſolved in a fixed alkali (for volatile alkalies will not diſſolve it), the ſolution is always green, which is the natural colour produced in all vegetable blues by the alkali: but if any piece of ſtuff is put into this ſolution, though it remains green while immerſed in the liquid, the moment it comes in contact with the air, the diſſolving power of the alkali is totally deſtroyed; the indigo is precipitated upon the cloth, reſumes its native colour, and dyes the cloth blue.

The cauſe of this precipitation is very difficult to be inveſtigated. Perhaps it may be owing to an attraction of fixed air by the alkali from the atmoſphere, which renders the ſalt unable to diſſolve the indigo any longer. The adheſion of the colour ſeems merely owing to an attraction between it and the cloth; for the alkaline ſalt can contribute nothing to this, but would rather have the contrary effect. Perhaps, however, the great ſolvent power poſſeſſed by alkaline ſalts, by perfectly clearing away every kind of ſordes, may bring the indigo and cloth into nearer contact with each other, than when it is diſſolved in any other way; and conſequently the attraction will in theſe caſes be the ſtronger. This ſeems to have ſome probability; for when indigo is diſſolved in vitriolic acid, as in dyeing Saxon blue, the colour is much more eaſily diſcharged.

Another exception is in the juices of ſome vegetables, ſuch as the nuts of the anarcadium. This produces, without addition, a moſt deep and laſting black, never to be waſhed out or diſcharged by any means whatever. Several other plants are to be found in different parts of the world, which give an indelible black ſtain upon linen without addition; and the colouring matter of theſe ſeems to adhere by means of a very tenacious gluten, with which it is mixed, and which, when once thoroughly dried, can never be again diſſolved. In this reſpect, theſe black ſtaining colours ſeem analogous to the *purpura* of the ancients; which ſtained indelibly without addition, and was of an exceedingly viſcous and adheſive nature.

SECT. II. *Practice of Dyeing.*

THE materials for dyeing different colours are ſo many and various, that an enumeration of them all is ſcarce to be expected. The ſame difference, however, takes place among the materials for dyeing which we have obſerved to take place among thoſe for *Colour-Making*. Some ingredients produce durable colours, which cannot be diſcharged either by expoſure to the air or by waſhing with ſoap: others, though they may be made to ſtand the action of ſoap pretty well, cannot by any means be enabled to reſiſt the action of the air. Theſe are diſtinguiſhed by the different names of *true* and *falſe*, *permanent* and *fading*, &c.; nor is there any method yet diſcovered of giving the falſe colours an equal degree of durability with the true ones. This hath been attempted by mixing a permanent and a fading colour together; in which caſe it was thought that the former would impart ſomewhat of its durability to the latter: but this hath always been found to miſgive; the fading colour ſoon flying off, and leaving the permanent one behind. Nay, in many caſes this does not even happen; for, by ſome means hitherto not accounted for, the volatile colour imparts its volatility to that which would otherwiſe be permanent. The ſame hath alſo been attempted by dyeing a piece of ſtuff partially with a fading colour, and then completing the dye with a permanent one. In this caſe it was hoped that the fading colour being covered over, and defended from the injuries of the air by the permanent one, would neceſſarily become equally durable, or at leaſt remain a much longer time than if the ſtuff was dyed with it alone. But this alſo hath been found ineffectual; and the fading colour hath been diſſipated as ſoon when covered with a permanent one, as when left without any ſuch cover.—Solution of tin in aqua regia will give moſt of theſe fading colours an high degree of beauty, and ſome ſhare of durability, though even that is not able to make them equal to the others.—The moſt permanent dyes we have are cochineal and gum lac for fine reds and ſcarlets; indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours. Weld, and ſome other vegetables, for yellow; and madder for coarſe reds, purples, and blacks.—The fading colours are much more numerous. In this claſs are included Brazil-wood, logwood, peach-wood, red-wood, fuſtic, turmeric root, annotto, archil, &c. &c.

15 True and falſe dyes.

16 Salts to be uſed in dyeing.

With regard to the ſalts made uſe of in dyeing, it hath been but too often cuſtomary to jumble together ſuch a quantity of different ones, that it was not only impoſſible to know in what particular ſalt the virtue reſided, but often the efficacy of the whole hath been totally deſtroyed, and the colour entirely ſpoiled by ſuch injudicious management. It is proper, therefore, where a mixture of two or more ſalts is intended to be made for dyeing, firſt to try the change of colour produced by each of the ſalts upon the colouring ſubſtance. If the colours are nearly alike, the mixture may be ſafely made as to that particular. But if the two colours produced by the different ſalts are very different from one another, to mix them together muſt be very injudicious. Thus, ſuppoſe you want to dye ſcarlet, ſolution of tin in aqua regia produces the neceſſary change of colour on the decoction of cochineal, and converts it into a high flame-colour, which ſhows it to be a proper ingredient; but to the ſolution of tin, it would ſurely be the greateſt abſurdity to add a quantity of ſaccharum ſaturni, the effect of which is to change the colour of cochineal to a dull purple. But though the ſalts taken ſeparately ſhould produce a colour nearly ſimilar, another thing muſt be regarded, namely, whether they can be mixed with ſafety to one another? It is the nature of many ſalts to deſtroy one another whenever they come into perfect contact by being diſſolved in water. Thus, ſolution of tin and ſaccharum ſaturni deſtroy one another; and ſo do ſolution of tin and tartar or cream of tartar. To mix theſe together muſt therefore be abſurd; and yet we find this laſt mixture ordered in almoſt every receipt for dyeing ſcarlet. It is alſo to be obſerved, that a mixture of different ſalts ought never to be made, out of a notion that the colour will keep the better on that account; for moſt commonly it will keep the worſe. A ſingle ſalt will anſwer for this purpoſe better than a hundred. A mixture ſhould only be made where it is neceſſary to produce the colour deſired; and if a dyer proceeds in this ſimple manner, he may not only attain to great perfection in the art from his own experience without being taught by others, but even make conſiderable diſcoveries; as dyeing is at preſent far enough from being brought to perfection.—The ſalts chiefly to be uſed in dyeing are fixed alkalies; ſolutions of tin in the vitriolic and marine acids, and in aqua regia; ſugar of lead; cream of tartar; alum; oil of vitriol; and ſolution of iron in the acetous acid. By means of theſe, almoſt all kinds of colours may be dyed at an eaſy rate, and with very little trouble.

17 Primitive colours in dyeing.

With regard to the operative part of this buſineſs, M. Hellot obſerves, that the whole depends on the uſe of ſome colours called by the workmen *primitive*, but which have no relation to the colours called primitive by Sir Iſaac Newton. The primitive colours uſed by dyers are in number five, viz. blue, red, yellow, fawn or root colour, and black. Each of theſe furniſh a great number of ſhades, both according to the nature of the ingredients themſelves, and the acid or alkaline ſubſtances with which they are mixed. Of theſe five colours only two ſhould be prepared with ingredients which produce no colour themſelves, but which, by their acidity, and the fineneſs of the earth they contain, diſpoſe the pores of the ſubſtance to receive the dye. Thoſe colours which in a more particular manner require ſuch a preparation are the red and yellow, with ſuch others as are derived from them. Black requires a particular preparation; but blue and fawn colour none, at leaſt for wool; it being ſufficient for the purpoſe to ſcour and ſoak this ſubſtance well; after which nothing more is required than to plunge it into the vat, ſtirring it well about, and letting it remain for a longer or ſhorter time as the colour is intended to be more or leſs deep.

18 Ingredients uſed in dyeing blue.

The ingredients uſed in dyeing blue are by our author determined to be three in number, viz. *paſtel*, *woad*, and *indigo*.

Paſtel, called in Latin *iſatis* or *glaſtum*, is prepared by gathering it when come to maturity, ſuffering it to rot, and then making it up into balls for drying. For this purpoſe it is cultivated in Languedoc, and is made up into balls of 150 or 200 pounds weight. Theſe reſemble a collection of little dry lumps of earth intermixed with fibres of plants. For extracting the colour, the dyer muſt provide himſelf with large wooden vats of a magnitude proportioned to the quantity of ſtuff to be uſed. Mr Hellot recommends them from ten to twelve feet in diameter, and ſix or ſeven in height. They ſhould be made of ſtaves ſix inches broad and two inches thick, bound with iron hoops about two or three feet aſunder. They are to be ſunk in the ground for the more eaſy management of their contents, which is done by means of hooks faſtened to the end of a ſtaff, the length of which is proportioned to the diameter of the vat. The bottom is made of lime and cement, though it might be made of wood, were it not for the difficulty of getting a wooden bottom ſtrong enough to ſupport the weight. The vats uſed for dyeing cottons of a blue colour, as M. de Apligny informs us, are generally formed of large brandy pipes newly emptied, or of oil hogſheads containing about 500 quarts. Before the latter are made uſe of, they ought to be well cleanſed, by ſlaking lime in them, and ſcrubbing with a broom till the oily matter is thoroughly diſſolved by means of the lime.

19 Preparations of the blue paſtel vat.

The preparation of the blue vat is the moſt difficult operation in the whole art of dyeing; and for this our author gives the following directions: "Your copper cauldron ſhould be placed as near as poſſible to the vat, and then filled with pond-water. If the water be not ſufficiently putrid, you put in a handful of hay, viz. two or three pounds, with eight pounds of brown madder, or the bark of the root. If you could have the old liquor of a madder vat, it would ſave freſh madder, and have a better effect. The fire ſhould be lighted about three in the morning, and the mixture ſhould boil an hour and a quarter; though ſome continue the boiling for two hours and an half or three hours. The liquor is now to be conveyed into the vat by means of a ſpout, the veſſel being very clean, and having a hatful of wheaten bran at the bottom. The paſtel balls are to be put into the vat one after another while the liquor is running into it, that they may be more eaſily broken, ſtirred, and mixed with the rake, an inſtrument compoſed of a ſtrong ſemicircular piece of wood, with a long wooden handle. The mixture ſhould be continually ſtirred till all the hot liquor is emptied out of the copper into the vat; and when the latter is rather better than half full, it ſhould be covered with a lid a little larger than the circumference. There ſhould alſo be a cloth put over it, to confine the heat as much as poſſible; after which the whole ſhould be allowed to remain four hours. It ought then to be uncovered, in order to mix it thoroughly, and to give it air. About an handful of lime ought now to be put in for every ball of paſtel; and after ſcattering in this ſubſtance, the vat ſhould again be mixed and covered as before, except about an handbreadth to let in the air. In four hours after it ſhould again be ſtirred, but without giving it any more lime; then it is to be covered and ſuffered to ſtand for three hours longer, leaving a ſmall opening for air as before. At the end of three hours it may again be uncovered and well ſtirred; and if it be not yet ready and *come to*, according to the language of the dyers, that is, if the blue does not riſe to the ſurface, but that it ſtill foams, which may be known by ſtriking with the flat of the rake, it will be neceſſary, after ſtirring it well, to let it ſtand an hour and an half longer, watching it carefully during that time in caſe it ſhould caſt blue. You then ſupply it with more water till the vat is full, putting in as much indigo as you think proper.

"The indigo uſed for this purpoſe ſhould be in ſolution; and in order to diſſolve it you muſt have a ſeparate

parate cauldron and furnace, and the veſſel ſufficient for diſſolving 80 or 100 pounds of indigo muſt contain 30 or 35 buckets of hard water. This ſhould be made into a lixivium, by putting 25 buckets of clear water into the copper with the addition of a hatful of bran, 12 or 13 pounds of madder, and 40 of good pot-aſh; that is, half a pound of alkaline ſalt and two ounces and a half of madder to each pound of indigo. It ſhould boil quickly for three quarters of an hour; after which the fire ſhould be taken away from the furnace, and the reſiduum ſtand for half an hour, in order to let the ſediment fall to the bottom. The clear liquor is then poured into a clean caſk placed cloſe to the copper. Take out the grounds at the bottom of the copper, waſh it clean, return the lixivium into the copper, light a ſmall fire under it, and at the ſame time put into the copper 80 pounds of indigo reduced to a groſs powder. The liquor ſhould then be made very hot, but not ſuffered to boil; and to facilitate the ſolution, it muſt be kept continually ſtirring with a ſmall rake, to prevent it from gathering into lumps, or from burning to the bottom of the copper. The liquor ſhould be kept moderately hot, and of as equal a degree of heat as poſſible, by throwing into it from time to time ſome lixivium of lime, which ſhould be at hand ready prepared, in order to cool it. As ſoon as you perceive that there are no longer any lumps in the bottom of the copper, and that the indigo is well diſſolved and diluted, the fire is to be withdrawn from the furnace, leaving only a few hot cinders to keep it warm. Cover up the copper then, and put in a pattern of ſtuff, which ought to be green when taken out, and turn blue immediately on being expoſed to the air. Should this not be the caſe, ſome freſh and clear lixivium, prepared as juſt now directed, muſt be added.

"In preparing the paſtel-vats, one common dye-houſe kettle full is to be put in for every ball of paſtel; the veſſel is then to be filled within ſix fingers breadth of the edge, when it is to be well mixed and covered as before.

"An hour after the vat has been ſupplied with water, it muſt have two meaſures (about two handfuls) of lime for every ball of paſtel, or in proportion as it is thought that it will be required; but as ſome kinds of paſtel require much leſs preparation than others, it is impoſſible to give any accurate directions upon the ſubject. In general, however, the lime ſhould not be ſcattered in till the vat be well ſtirred.

"Having again covered the vat, a pattern is to be put in at the end of three hours, which ſhould alſo be kept three hours immerſed in the liquor, when it is to be taken out, in order to examine the ſtate of the vat. The pattern, as has already been obſerved, ought to be green when immediately taken out, but inſtantly to turn blue; and if it is of a good green, you ſtir the vat, adding one or two handfuls of lime, and then cover it. Three hours afterwards it is to be ſtirred again, adding more lime if neceſſary. Cover it then for an hour and an half longer; and when the matter is ſettled, immerſe a pattern, which muſt remain for an hour, and then be inſpected to know the ſtate of the paſtel. If the pattern be of a good green when taken out, and becomes a deep blue when expoſed to the air, another pattern is to be put in, in order to aſcertain the effect of the vat. Should the colour of the pattern be ſufficiently high, the vat is to be filled with hot water, or, if it can be procured, the liquor of an old madder vat, and then ſtirred again. If the vat wants lime, a ſufficient quantity muſt be added according to the ſmell, and as it may be found neceſſary during the working. This being done, and the vat brought to a proper ſtate, it is to be once more covered for an hour; after which the ſtuffs are to be immerſed in it."

20
M Hellot's method of preparing a blue vat on a ſmall ſcale.

This operation is ſuppoſed by ſome dyers to be impracticable, except upon a very large ſcale; but M. Hellot has made ſome experiments on this ſubject, which ſeem to evince the contrary. For this purpoſe he took a little barrel containing about 25 gallons, and put it into a copper full of water kept carefully heated. He then put 20 gallons of water into a ſmall copper with an ounce and a half of madder, and a very ſmall handful of dyer's weed; which laſt, however, he does not ſuppoſe to be of any uſe. Having made the whole to boil together for three hours, he poured all the liquor into the barrel about nine in the evening, previouſly putting into it two ſmall handfuls of bran. At the ſame time he added four pounds of paſtel; and having ſtirred it well for a quarter of an hour, he covered it up, and took care to have it ſtirred every three hours during the night. It is cuſtomary to put ſome ſour water into the large vats, but this was omitted in the preſent caſe; and the bran, which ſoured with the liquor, was found to be a ſufficient ſubſtitute. Next morning the mixture was found to be in a ſtate of fermentation, frothing up and making an hiſſing noiſe. On mixing it well, and adding an ounce and an half of ſlaked lime, the froth was increaſed; and as the ſmell became ſtronger, it was judged proper to add a little more paſtel. At half an hour after ten the vat ſmelt ſtronger of the lime; a pattern was put into it; and at the expiration of an hour, it was taken out green; and which, on being expoſed to the air, became blue. On being ſtirred, another pattern was put in about an hour afterward; which having alſo remained an hour immerſed in the liquor, came out afterwards of a deeper blue than the former. At half an hour after twelve two ounces of indigo, not diſſolved, but only powdered, ſifted, and diluted with hot water, were put in, with about the bigneſs of a walnut of the *cendres gravelees* or burnt lees of wine, which contain a large quantity of alkaline ſalt; and every two hours afterwards a pattern was put in an hour after ſtirring the vat, letting each alſo remain an hour in the liquor. This was continued till ten o'clock; and the laſt patterns were not only evidently darkeſt, but of the brighteſt colour.

The laſt pattern ſhowed that the lime was exhauſted; but on account of the lateneſs of the hour, our author added only another half ounce of lime, and an hour after put in another pattern; which after having remained an hour in the liquor, was taken out more blue than the reſt, though the colour had been rendered leſs lively by the lime. Two other patterns put in during the night were ſtill darker, though the colour was ſomewhat dull; an evidence that the lime was not yet exhauſted. The paſte which lay at the bottom was of a yellowiſh brown when taken out, but by expoſure to the air became of an olive green. Under the ſurface it appeared of the ſame colour if moved with the hand, but inſtantly became green, ſmelling rather ſtrong, though not very much of the lime. The liquor itſelf was of the colour of beer, but the ſcum or froth of a blue colour. Patterns were now put in every two hours till two in the afternoon; when that which was taken out appeared of ſuch a fine blue, that it was judged proper to fill the vat. For this purpoſe about eight gallons of water were put into a little copper with a quarter of an ounce of madder and an handful of bran; and when it had boiled for half an hour, the liquor was put into the little vat for three hours. On ſtirring and letting it then remain for an hour afterwards, a pattern was put in, which in an hour's time was taken out of a beautiful blue. An ell of ſerge was then immerſed by means of what our author calls a *croſs*; which is an iron hoop with a net faſtened to it, the meſhes of which are about an inch ſquare; and the whole may be ſuſpended at any height required by means of three or four cords faſtened to it. The ſerge had no other preparation than being made thoroughly wet; nevertheleſs, in about a quarter of an hour it was taken out very green, and on being wrung out turned blue; but on a ſecond immerſion for another quarter of an hour, the colour turned out much more lively and brighter than could have been expected. The experiment was repeated with a pound of worſted; but the vat had been ſo much exhauſted that it came out only a ſkye blue; however, by ſprinkling in about half an ounce of freſh lime, the colour was afterwards made ſufficiently deep.

21 His directions for working the paſtel vat.

For working this vat our author gives the following directions. 1. It is in a proper ſtate for working, *i. e.* for imparting the blue colour to the ſtuffs put into it, when the ſediment or grounds at the bottom is of a fine brown green; when it changes upon being taken out of the vat; when the froth which riſes to the top is of a fine Perſian blue; and when the pattern, which had been ſteeped for an hour, is of a fine green colour. 2. The vat is alſo in a proper ſtate for working, when the liquor is clear and reddiſh, and the drops which adhere to the rake are of a brown colour. 3. When the liquor is neither harſh nor too greaſy to the feel, and when it ſmells neither of lime nor of the lixivium. 4. It may be known when too much lime has been put in, by the colour of the pattern immerſed in the liquor; which, inſtead of being a fine graſs green, will be only a dirty greyiſh blue, or ſome other colour of that kind. The ſame thing may likewiſe be underſtood when the ſediment does not change colour; when there is ſcarce any efflореſcence on the vat; and when the liquor ſmells only of lime or lixivium.

In order to rectify the ſtate of the vat in this caſe, ſeveral methods have been recommended by practical dyers. 1. Some uſe tartar or bran, adding a quantity of either as occaſion may require. 2. Others attempt to correct it by throwing in a bucket of urine. 3. Sometimes they uſe a large iron ſtove, which may reach from the grounds at the bottom to the top of the vat. This machine is furniſhed with a grate about a foot from the bottom, and an iron funnel, one end of which commences with the grate, and communicates with the external air. On forcing down the ſtove to the bottom of the vat, where it ought to be retained by iron bars, the heat of the ſtove will force up the lime to the top, where as much as is required may be taken out by a ſieve. 4. Some dyers correct a vat which has got too much lime with urine and tartar: but the beſt method, according to our author, is to put into it a ſufficient quantity of bran and madder; and if the exceſs of lime is not very great, it may be allowed to ſtand four, five, or ſix hours, or more, adding to it two hatfuls of bran and three or four pounds of madder, which ſhould be ſlightly ſprinkled on the top without any covering. At the end of four or five hours it ſhould then be ſtirred by a rake, and a pattern put in to try the effect of it. If the blue does not riſe until it be cold, it ought to have time to recover, by allowing it to ſtand without diſturbance, which ſometimes requires whole days to accompliſh; but, in general, the lime which ſeems to want ſtrength to carry on the fermentation, revives and prevents the vat for ſome time from yielding any colour. To bring it forward, ſome bran and madder ſhould be ſprinkled on the top, beſides an addition of two full baſkets of freſh paſtel, which aſſiſts the liquor, when heated again, in diſſolving the lime. 5. The vat ought now to be frequently tried by putting in a pattern, that from one hour to another you may be able to judge by the green colour how far the lime has operated. Thus the operation may be accurately conducted; for when the vat has ſuffered either by too much or too little lime, it is very difficult to manage it. 6. If, during the time that you are thus employed in retrieving the vat, it ſhould cool too faſt, you muſt endeavour to preſerve the heat by emptying ſome of the liquor, and replacing it with hot water; for when the liquor grows cold, neither the paſtel nor lime are conſumed but in very ſmall quantity. The action of the lime is alſo retarded by too great a degree of heat; and in this caſe it is proper rather to wait a little than to be in too great a hurry to reſtore the vats. 7. It is evident that the vat has ſuffered by not being ſufficiently ſupplied with lime, when there are no large air-bubbles on the top of a fine blue colour, but only a ſettled froth of ſmall tarniſhed bubbles; and when, by daſhing upon the ſurface of it with the rake, it makes a hiſſing noiſe produced by the breaking of a vaſt number of theſe ſmall air-bubbles as ſoon as they are formed. The liquor has alſo an offenſive ſmell like rotten eggs, and the ſediment does not change colour when taken out of the liquor. This accident will very probably take place, if you do not carefully attend to the ſmell of the vat, but imprudently put in the ſtuffs when the paſtel has ſpent the lime; for in that caſe the ſmall quantity of lime which remains will adhere to the ſtuffs, and will thus give them a bad colour. When this is perceived, you muſt immediately take them out, and add three or four handfuls of lime in proportion to what you ſuppoſe the vat has ſuffered, but without ſtirring it up from the bottom. On ſtirring the vat you ought to attend to the noiſe as well as to the ſmell; for if the hiſſing ceaſes, and the bad ſmell is alſo removed, there are great hopes that the liquor only has ſuffered, and that the paſtel is not impoveriſhed. But when the liquor ſmells of lime, and is ſoft to the feel, the vat is then to be covered, and allowed to ſettle for an hour and an half; after which period, if the efflorеſcence commences, a pattern is to be put in, and the ſubſequent proceſs is to be regulated by the colour it aſſumes.

Some are of opinion that the paſtel blue is much ſuperior to that obtained with a mixture of indigo; but it is undoubtedly much dearer, as yielding a much ſmaller quantity of colour: and from the experiments of M. du Fay, as well as of our author on this ſubject, it appears that the prejudice in favour of paſtel is by no means well founded. When a vat has been heated and well worked two or three times, the ſame colour is frequently preſerved, only taking out part of the ſediment, and ſupplying it with freſh paſtel; but for this no directions can be given, as it is evident that the whole muſt be regulated by the practice of the dyer. Some are accuſtomed to allow the ſame liquor to remain for years in their vats, only ſupplying it with ingredients from time to time; but this practice ſeems not to meet our author's approbation, who thinks it rational to ſuppoſe that the beſt colours will be made by emptying the vats entirely when they have been heated ſix or ſeven times, and ceaſe to give any more colour.

22 Danger of reheating a paſtel vat when the lime is exhauſted.

With regard to the reheating of the paſtel vats, our author further obſerves, that if you heat a vat when it is exhauſted, viz. when deficient in lime, it will imperceptibly turn in ſuch a manner as to be in danger of being ſpoiled; becauſe the lime, already too much diminiſhed, will be entirely conſumed by the heat. The only remedy, if diſcovered in time, is to throw it back into the vat, to ſupply it with lime, and then wait till it recovers before you reheat. In this operation alſo care ſhould be taken to put the grounds into the copper with the liquor; and it muſt not be allowed to boil, otherwiſe ſome of the more volatile parts neceſſary for producing a good colour will be evaporated. Some do not put the indigo into the vat until ſome hours after the liquor has been emptied out of the copper, and the mixture begins to recover itſelf. This precaution is taken leſt the vat ſhould not recover, and then the indigo would be loſt. An inconvenience, however, ariſes from this practice, viz. that the indigo does not give out its colour freely; ſo that it is beſt to put it into the vat immediately with the liquor, and to ſtir it well afterwards. If a vat that has not been worked is to be reheated, it muſt not be ſkimmed as in the common operations of this kind, for then the indigo would be ſkimmed off; but in ordinary caſes the ſcum is compoſed of the earthy particles of the indigo and paſtel, with a ſmall quantity of lime. When too much lime is added, you muſt wait till it be conſumed. It might indeed be corrected by an addition of acid or other ingredients; but as theſe alſo conſume the colour, it is better to wait the natural operation of the lime itſelf. Weak lime proves likewiſe diſadvantageous, becauſe it remains in the liquor without incorporating with the paſte. When this is the caſe, the paſte ſmells ſtrong, and the liquor has a kind of ſweetiſh ſmell; but both ought to be alike in this reſpect. The remedy is to haſten the ſolution by ſtirring it often in order to mix the lime with the paſte, till the proper ſmell of the vat be reſtored, and the froth on the ſurface becomes blue.

23 To ſlack lime for the purpoſes of dyeing.

To ſlack the lime for the purpoſe of dyeing, ſeveral pieces are to be thrown into water one after another, taking out each piece when it begins to ferment, and putting in another. It is then put into an empty copper or other veſſel; and when fallen thoroughly into powder, it is to be ſifted through a fine ſieve, and kept in a very dry caſk.

24 Preparation of acid waters.

In this operation acid waters are ſometimes neceſſary; the method of preparing which is as follows: Fill a copper of any ſize with river water; put fire under it; and when it boils, throw it into a caſk in which you had before put a ſufficient quantity of bran. It ſhould be well ſtirred three or four times a-day. Three buſhels of bran into a veſſel containing about 70 gallons of water have been found to anſwer the purpoſe. This water, at the end of four or five days, becomes acid; and therefore may be applied in all caſes where it does not injure the preparation of the worſted. It muſt be obſerved, however, that woollen fleece, by too great a quantity of acid liquor, would be rendered difficult to ſpin, as being in a manner glued together by the matter proceeding from the bran. It is alſo neceſſary to take notice, that the acid muſt not be left in the cauldron, eſpecially if this is made of copper; becauſe it will corrode enough of the metal to occaſion a deficiency in the colour. This metal, when diſſolved, gives a greeniſh colour.

25 Conſtruction of Dutch vats;

The Dutch vats are conſtructed in ſuch a manner as to require leſs frequent heating than thoſe above deſcribed. The upper part of them for three feet downward is of copper, and they are almoſt ſurrounded by a brick wall at about the diſtance of ſix or ſeven inches from the metal. A quantity of hot embers are depoſited in this interval, which maintain the heat of the vat ſo effectually, that it remains for ſeveral days in a ſtate fit for working even after it becomes very weak. This is not the caſe with the others, which frequently give a much deeper colour than was intended, unleſs you ſuffer them to grow conſiderably colder; and in that caſe the colour is leſs bright.

26 Of the woad-vat.

The woad-vat differs from that already deſcribed only in being weaker and yielding leſs colour; but it is prepared in the ſame manner. The following is a deſcription of the woad vat, according to an experiment made by M. Hellot, ſimilar to that concerning the paſtel already mentioned.

"I placed (ſays he) in a cauldron a ſmall caſk containing about twelve gallons, two-thirds full of river-water, an ounce of madder, and a ſmall quantity of weld; at the ſame time I put into the caſk a good handful of bran and five pounds of woad. At five o'clock in the evening the vat was well ſtirred and covered. It was again ſtirred at ſeven, at nine, at twelve, at two, and at four. The woad was then working, as has been already obſerved with regard to the paſtel. Some air bubbles began to riſe pretty large, but in a ſmall quantity, and of a very faint colour. It was then garniſhed with two ounces of lime, and ſtirred. At five o'clock I put in a pattern which I took out at ſix, and again ſtirred. This pattern had received ſome colour. At ſeven o'clock I put in another, and at eight ſtirred again. This pattern was tolerably bright: I then added an ounce of indigo; at nine o'clock another pattern; at ten ſtirred again, and put in an ounce of lime becauſe it began to ſmell ſweetiſh; at eleven another pattern, and at twelve ſtirred again. This proceſs was continued till five o'clock. I then added three ounces of indigo. At ſix I tried another pattern, and at ſeven ſtirred again. It would have been now time to fill it, being in a proper ſtate for working, as the laſt pattern which had been taken out very green became a bright blue: but as I was very much fatigued, having ſat up the whole night, I choſe to defer it till the next day, in order to ſee its effect by day-light; and for this reaſon I added an ounce of lime, ſufficient to ſuſtain it till nine o'clock in the morning. Patterns were put in from time to time; and the laſt being very beautiful, I filled the vat with a liquor compoſed of water and a ſmall handful of bran only. It was then ſtirred, and patterns tried every hour. Being in a proper ſtate at five o'clock, it was immediately worked. It was then garniſhed with lime, and mixed, in order to preſerve it till ſuch time as it might be convenient to reheat.

“ Two months afterwards I prepared another woad vat without indigo, that I might be enabled to judge of the ſolidity of the dye; and was convinced, by experiment, that it was of equal goodneſs with the paſtel. Hence the paſtel is ſuperior to the woad only becauſe the latter yields leſs colour than the other.

27
M. Hellot's remarks on the preceding operations.

“ The little variations to be obſerved in the method of ſetting theſe different vats, ſufficiently demonſtrates that there are many circumſtances in the ſeveral proceſſes not abſolutely neceſſary. In my opinion, the only matter of importance, and which demands attention, is to conduct the fermentation with caution, and to avoid ſupplying with lime till, from the indications I have deſcribed, it appears neceſſary. With regard to the indigo, whether it be added at twice or all at once, whether a little ſooner or a little later, is, I think, of very little importance. The ſame may be ſaid of the weld, which I uſed twice, and twice omitted; and likewiſe of the pearl-aſh, a little of which I put into the ſmall paſtel vat, and omitted in that of the woad. In ſhort, it appears to me very demonſtrable, that the diſtribution of the lime either in the ſetting or reheating the vats requires moſt attention. It muſt alſo be obſerved, that in ſetting either a paſtel or woad vat, it cannot be too frequently examined; becauſe though ſome are too ſlow, which is attributed to the weakneſs of the paſtel or woad, others become too ſoon ready for working. I have ſeen ſeventy pounds of paſtel loſt by this neglect. It was ready for working at eight o'clock, but for want of the workman's conſtant inſpection, he did not diſcover it till two hours afterwards. The paſte was then entirely riſen to the ſurface of the liquor, which ſmelt very ſour. It was now impoſſible to recover it; he was therefore obliged to throw it out immediately, or it would very ſoon become inſupportably putrid and fetid.

“ This difference in the vat may be alſo produced by the temperature of the air, as it cools much ſooner in winter than in ſummer. It is therefore neceſſary to watch very attentively, though it is ſeldom fit for working in leſs than 14 or 15 hours.

28
Of the indigo vat.

“ The indigo vat (ſays our author) is about five feet high, two feet in diameter, and grows narrower towards the bottom, being ſurrounded by a wall, and a vacancy left for the embers. In a vat of this ſize you may put from two to five or ſix pounds of indigo. In order to ſet a vat containing twenty gallons, you boil in a copper about fifteen gallons of river-water for half an hour, with two pounds of pot-aſh, two ounces of madder, and a handful of bran. The indigo is prepared mean while in the following manner:

“ Take two pounds of indigo, and put it into a pail of cold water, in order to ſeparate the ſolid from the volatile particles, which will immediately riſe to the ſurface. The water is then poured off, and the remaining indigo pounded in an iron mortar; you then put a little hot water into the mortar, ſhaking it from ſide to ſide, and pouring into another veſſel that which ſwims, and which is conſequently the beſt bruiſed. In this manner you continue to pound what remains in the mortar, ſtill adding freſh water, in order to make the fineſt part riſe to the ſurface, and ſo on till all the indigo is reduced to a powder ſo fine as to riſe in the water, which is all the preparation required. The liquor which had boiled in the copper, with the grounds of the madder and pot-aſh, which probably fell to the bottom, is thrown into the high narrow vat; at the ſame time adding the pounded indigo. The whole is then well ſtirred with a rake, the vat covered, and the embers put round it. If this operation was begun in the afternoon, you muſt renew the hot embers in the evening, which ſhould alſo be repeated both morning and evening the next day: the vat ſhould be lightly ſtirred twice the ſecond day. In order to maintain the heat of the vat, you renew the embers on the third day, ſtirring the vat twice. You then perceive, that a ſhining braſſy ſcum, divided and interrupted in many places, begins to riſe on the ſurface. By continuing the heat, on the fourth day the ſcum becomes more perfect and leſs broken. The froth that riſes upon ſtirring is now blue, and the vat a deep green.

“ When it becomes green in this manner, it is an indication that the vat ſhould be filled. For this purpoſe you muſt prepare a freſh liquor, by putting five gallons of water into a copper, a pound of pot-aſh, and half an ounce of madder. When this has boiled a quarter of an hour, you fill the vat. You then ſtir it; and if it produces much froth, it will be in a proper ſtate for working the next day. This is ſufficiently known by the quantity of froth, and by the braſſy ſcaly cruſt that ſwims on the top of the liquor; alſo when, by blowing or ſtirring it with the hand, the liquor beneath is green, though the ſurface appears of a brown blue.

“ This vat, of which I have juſt deſcribed the proceſs, and the firſt I had ſet, was much longer in coming to a colour than the others, becauſe the heat was too ſtrong the ſecond day; but for this accident, it would have been ready for working two days ſooner. It was attended with no other bad conſequence; and therefore, as ſoon as it was in a proper ſtate for working, I dipped at ſeveral times 30 or 40 pounds of ſerge. As the liquor was by this means diminiſhed and weakened, it was neceſſary in the afternoon to repleniſh with a freſh mixture, compoſed of a pound of pot-aſh, half an ounce of madder, and a handful of bran. Having boiled this a quarter of an hour, it was put into the vat; which was then ſtirred, covered, and a few embers put round it. In this manner it may be kept for many days; but when you mean to work it, it ſhould be ſtirred the preceding evening, and ſupplied with hot embers.

“ When you would reheat this kind of vat, and repleniſh it with indigo, you put into a copper two-thirds of the liquor, now no longer green, but of a brown blue and almoſt black. When it is ready to boil, the ſcum on the top ſhould be taken off with a ſieve; after which it ſhould be ſuffered to boil, with the addition of two handfuls of bran, a quarter of a pound of madder, and two pounds of pot-aſh. The embers are then taken from under the copper, and a little cold water thrown in to ſtop the boiling. It is then emptied into the vat, with the addition of a pound of indigo pulverized and diſſolved in ſome of the liquor, as I have ſaid above. The vat being then ſtirred, covered, and a few hot embers put round it, will be fit for working the next day.

“ When an indigo vat has been reheated ſeveral times, it ſhould be emptied out entirely and ſet anew, becauſe the colour becomes dull: for though heated, and in a proper ſtate for working, the green colour is not ſo beautiful as at the beginning.

“ I have had ſeveral other vats ſet in the ſame manner, with a greater or leſs quantity of indigo; as from one to ſix pounds, proportionably increaſing or diminiſhing the other ingredients; always, however, putting a pound of pot-aſh to a pound of indigo. From other experiments which I have ſince made, I am convinced that this proportion was not abſolutely neceſſary. I am alſo perſuaded that there are many other methods for the preparation of the indigo vat equally effectual. I ſhall nevertheleſs make ſome obſervations concerning this vat.

“ Of all thoſe which I have had prepared in this manner, I failed but in one; which was occaſioned by neglecting to put hot embers round it on the ſecond day. I added ſome pulverized arſenic, but without any effect; it would never come to a colour. Red-hot bricks were alſo thrown into it at ſeveral times; the liquor at times became greeniſh, but never ſufficiently. At length, after having to no purpoſe tried ſeveral other means without being able to diſcover why it did not ſucceed, and having reheated it ſeveral times, I had it thrown out at the fortnight's end.

“ The ſeveral other accidents which I met with in the conduct of the indigo vat only retarded the ſucceſs; ſo that this operation may be conſidered as very eaſy in compariſon of the paſtel or woad vat. I have indeed made ſeveral experiments on each of them, with an intent to ſhorten the time of the preparation; but for the moſt part not ſucceeding, or at leaſt not better than by common practice, it is needleſs to deſcribe them.

29
Differences betwixt the indigo and paſtel liquors.

“ The liquor of the indigo vat is not in every reſpect like that of the paſtel. Its ſurface is a brown blue, covered with coppery ſcales, and the liquor itſelf of a fine green. The ſtuff or woollen which it dyes is green when taken out, and becomes blue immediately afterwards. The ſame obſervation has been made with regard to the paſtel vat, but it is very ſingular that the liquor of the latter is not green, though it produces the ſame effect upon woollen as the other. It is alſo neceſſary to obſerve, that when the liquor of the indigo vat is changed out of the veſſel, and too long expoſed to the air, it loſes its green colour, and at the ſame time all its qualities; ſo that, though it yields a blue colour, it is not permanent.

30
Cold indigo vat with urine.

“ There is likewiſe a cold preparation of an indigo vat with urine, and it is alſo worked cold. For this purpoſe, you take four pounds of indigo powdered, and put it into a gallon of vinegar, leaving it to digeſt over a ſlow fire for 24 hours. At the expiration of this time, if it be not perfectly diſſolved, it is again pounded in a mortar with the liquor, adding now and then a little urine. You afterwards put into it half a pound of madder, mixing it well by ſtirring the whole with a ſtick. When this preparation is finiſhed, you pour it into a caſk containing 60 gallons of urine: it is of no conſequence whether it be ſtale or freſh. You mix and ſtir the whole well together; and this ſhould be repeated morning and evening during the ſpace of eight days, or till the ſurface of the liquor becomes green when ſtirred, and produces froth like the common vats. It may be worked immediately without any other preparation than ſtirring it three or four hours before hand. This kind of vat is extremely convenient; becauſe when it is once prepared, it remains ſo always till it is entirely exhauſted, that is to ſay, till the indigo has yielded all its colour: hence it may be worked at all times, whereas a common vat muſt be prepared over night.

“ According as you would have this vat more or leſs conſiderable, you augment or diminiſh the ingredients in proportion to your quantity of indigo: thus for every pound of indigo you always put a quart of vinegar, two ounces of madder, and fifteen gallons of urine. This vat is much ſooner prepared in ſummer than in winter. If you would haſten it, you need only take a little of the liquor, heat it in a copper without ſuffering it to boil, and afterwards pour it into the vat. This operation is ſo very ſimple, that it is almoſt impoſſible it ſhould fail.

“ When the indigo is entirely exhauſted, the vat may be renewed by diſſolving ſome freſh indigo in vinegar; but you muſt add madder in proportion to the quantity of indigo, and then pour it into the vat, which ſhould be ſtirred as at firſt morning and evening: it will be as good as if it were freſh. This, however, ſhould not be repeated more than four or five times; becauſe the grounds of the madder and indigo would tarniſh the liquor, which would conſequently render the colour leſs bright. I muſt however confeſs, that as I have not myſelf experienced this vat, I cannot anſwer for its ſucceſs: but the following with urine, which I have ſeen prepared, dyes woollens a very permanent blue.

31
An hot vat with urine.

“ A pound of indigo was firſt ſteeped in a gallon of urine for 24 hours; it was afterwards ground in a large iron mortar with the ſame urine. When by this means the urine became very blue, it was ſtrained through a fine ſieve into a ſmall tub; but the indigo which remained in the ſieve was beaten again in the mortar with another gallon of freſh urine, and this was repeated till all the indigo paſſed through the ſieve with the urine. This operation, which continued two hours, being finiſhed, about four o'clock in the evening 62 gallons of urine were put into a copper, which was made very hot, but without boiling; and the ſcum which roſe on the ſurface of the urine was bruſhed off the copper with a beſom. This was frequently repeated till nothing roſe but a ſlight white ſcum. The urine being thus ſufficiently purified and ready to boil, it was thrown into the wooden vat; the prepared indigo was then added, and the vat ſtirred with a rake, in order that the indigo ſhould incorporate with the urine. Immediately afterwards a mixture, conſiſting of a gallon of urine, a pound of alum, and a pound of red tartar, was added to the vat; but theſe were firſt reduced to a fine powder. The urine was then poured out on it in the mortar, and mixed together till it ceaſed to ferment. It was then poured into the vat, well ſtirred, and covered. In this ſituation it was left all night. The next morning the liquor was very green. This ſhowed that the vat was in a proper ſtate, and that it might have been uſed; but it was ſuffered to remain without working, becauſe all that had been hitherto done was only the firſt preparation of the vat, and the indigo which had been put into it was deſigned only to nouriſh and temper the urine. Hence the vat was ſuffered to reſt two days in order to complete the preparation, but covered all the time to prevent it from cooling too faſt. It was then managed as follows: A ſecond pound of indigo was beaten with purified urine as above. About four o'clock in the afternoon the whole vat was emptied into the copper: it was then made very hot, but not boiled. It ſtill produced a thick ſcum, which was taken off; and the liquor, being near boiling, was returned into the vat. The indigo was immediately added, bruiſed as above, with a pound of alum, a pound of tartar, and two quarts of urine, with the addition of another pound of madder: it was then ſtirred, cloſe covered, and ſuffered to remain ſo all night. The next morning it was in very good order; the liquor being very hot, and of a beautiful green: hence it was evidently in a proper ſtate for dyeing; which was executed in the following manner. The ſubſtance to be dyed was woollen fleece.

"This fleece had been well ſcoured with urine, well waſhed, and perfectly well drained. Being thus prepared, 30 pounds of it were put into the vat. It was then well opened with the hands, that it might be equally drenched; and after this it was ſuffered to remain an hour or two according to the degree of ſhade that was required. During this time the vat was kept cloſe covered, in order to preſerve the heat; for the hotter it is, the better it dyes: when it becomes cold, it ceaſes to act. When the wool was ſufficiently blue, it was taken out in large balls, as big as a man's head; and at the ſame time ſqueezed and wrung over the vat, and immediately given to four or five women who ſtood round the vat, in order to open it, and expoſe it to the air between their hands till the green colour which it had coming out of the vat changed to blue. This change was produced in three or four minutes. Theſe 30 pounds being thus dyed, the vat was raked, and then ſuffered to ſtand for two hours, keeping it always cloſe covered. At the expiration of this time they put in another 30 pounds of wool, which was opened well with the hands. The vat was again covered; and in four or five hours this wool had taken as good a colour as the former: it was then taken out of the vat in balls in the ſame manner as the former. This operation being finiſhed, the vat was ſtill warm, but not ſufficiently ſo to dye any more wool; for when it has not a ſufficient degree of heat, the colour which it yields will be neither uniform nor ſolid: hence it is neceſſary to reheat and repleniſh with indigo as before. This may be done as often as you think proper; becauſe this vat never ſpoils by age, provided that while it is kept idle you give it a little air.

"About four o'clock in the afternoon all the liquor was emptied into the copper, with the addition of a ſufficient quantity of urine to replace what had been evaporated and loſt in the preceding work. This generally requires about eight or nine buckets of urine. The copper was then heated, the ſcum taken off as before: when ready to boil, it was returned into the wooden vat. You add to it a pound of indigo, pounded and mixed with urine as above, a pound of alum, a pound of tartar, a pound of madder, and two quarts of urine. After the vat is ſtirred and cloſe covered, it is ſuffered to ſtand all night. It will be in a proper ſtate the next day, and capable of dyeing 60 pounds of wool at twice, as above. In this manner, the reheatings ſhould be always done the day before you want to dye, and may be repeated *ad infinitum*.

"It is neceſſary to obſerve, that the more indigo you put into the vat at once, the deeper the colour: thus, inſtead of one pound, you may add four, five, or ſix, without increaſing the quantity of alum, tartar, or madder; but if the vat contains more than three hogſheads, the quantity of the ingredients ſhould be proportionably augmented. That which I have juſt mentioned contained only three hogſheads, and was conſequently too ſmall to dye at one time a ſufficient quantity of wool to make a piece of cloth, *viz.* 55 or 60 pounds. To do this properly, it ſhould contain ſix hogſheads, which would be attended with a double advantage. Firſt, all the wool might be dyed in two or three hours; whereas, by twice dipping, it could not be finiſhed in leſs than eight or ten. Secondly, at the expiration of the three hours, the vat would be ſtill very warm; ſo that, after ſtirring and letting it ſettle for a couple of hours, the ſame wool may be dipped again. By this means the colour is heightened almoſt as much more; becauſe wool once dyed always takes a much better colour than new or white wool, though ſuffered to remain in the vat even for 20 hours.

"It is neceſſary to be very attentive in opening the dyed balls as ſoon as they are taken out of the vat, and expoſing them to the air, in order to change them from green to blue, which ſhould be done by many hands at the ſame time, that they may be equally affected by the air, elſe the blue colour will not be uniform.

32
Paſtel vats preferable to the above.

"Some manufacturers pretend that cloth, the wool of which had been dyed in this urine vat, cannot be perfectly ſcoured by fulling even at twice; others affirm the contrary, and I believe they are right. Nevertheleſs, if the firſt be right, one would ſuppoſe that the animal oil of the urine was become reſinous by drying on the wool, or that incorporating with the oil by which the wool had been moiſtened for its other preparations, it would be more likely to reſiſt the fuller's earth and ſoap than ſimple oil by expreſſion. To remedy this, it is only neceſſary to waſh the wool in running water after it has been dyed, expreſſed, and opened, ungreened, and again cold. Be this as it may, a paſtel vat in a large dye-houſe is preferable to thoſe kinds of indigo vats prepared with urine; becauſe with a good woad vat and a dexterous woad-man, you expedite more work than could be accompliſhed with any other blue vat. In mentioning the ſeveral indigo vats in this treatiſe, my deſign is not ſo much to introduce them to great manufactories, as to aſſiſt thoſe who work at ſmall fabrics; to whom, I flatter myſelf, this treatiſe will be equally uſeful. I will even deſcribe a cold vat for the dyers of ſmall ſtuffs mixed with thread or cotton, which ſucceeds very well, but which would be of no uſe for woollens.

33 Another cold indigo vat.

" In ſome places they make uſe of a cold indigo vat, differing from that already mentioned, which is more commodious, as it is much ſooner ready, and has no bad ſmell. It is prepared in the following manner.

" Three pounds of indigo, well pulverized, is put into a glazed earthen veſſel, and diſſolved in three pints of ſoap-boiler's lixivium, which is a ſtrong ſolution of foſſile alkali with quicklime. I have made uſe of a ſolution of potaſhes, and ſucceeded very well. The ſolution of indigo is performed in about 24 hours, as may be eaſily diſcovered by its remaining ſuſpended in the liquor, which is thereby thickened, and becomes like an extract. At the ſame time you put into another veſſel three pounds of ſlacked lime ſifted with ſix quarts of water. The whole ſhould boil during a quarter of an hour, and when ſettled ſhould be drained off clear. You afterwards diſſolve in this lime-water three pounds of green copperas, ſuffering it to ſettle till the next day. You then put 75 gallons of water into a large deal caſk, the only wood proper for the purpoſe; as any other, particularly oak, would blacken and tarniſh the liquor. The two ſolutions, which had been prepared the night before, are then added, the vat ſtirred, and left to ſettle. I have ſeen it ſometimes take the colour in two hours; but with this vat it was very different, not being ready till very late the next day. It produces a great quantity of froth; and the liquor takes a fine green colour, but a little yellowiſh, ſomething like the green of the common vat.

" When the vat is almoſt exhauſted, it is repleniſhed and quickened without freſh indigo, by adding to it a ſmall liquor, conſiſting of two pounds of green copperas diſſolved in a ſufficient quantity of lime-water. But when the colour of the indigo is quite exhauſted, it ſhould be repleniſhed with freſh indigo diſſolved in a lixivium, ſuch as I have juſt deſcribed. It is natural to ſuppoſe, that the quantity of your other ingredients muſt be augmented or diminiſhed in proportion to the indigo. Some dyers uſe a mixture of vinegar and water impregnated with ruſty iron. They ſuppoſe that the colour is thereby rendered more ſolid; but I am convinced by experience that there is no neceſſity for it, and that the colour is as permanent as any of the other blues prepared as I have directed above.

" The firſt time I prepared this vat, I proceeded according to a receipt ſent me from Rouen. The ſoap-boiler's lixivium was ſimply denominated *ſtrong water*. I ſuſpected this to proceed either from malice or miſtake, nevertheleſs, as in matters of fact it is unjuſt to condemn without examination, I tried the common aqua-fortis, which produced the following effect.

34 Effects of aquafortis upon indigo.

" I took half a pound of indigo, well powdered, and ſteeped it in half a pint of common aqua-fortis, made with vitriol and ſalt-petre: this produced a fermentation. In this ſituation I left it for 24 hours; and having, as in the preceding operation, diſſolved a pound of copperas in ſome lime-water, I poured theſe two mixtures into a caſk containing about 17 gallons of river water. I ſtirred it well, but there appeared nothing extraordinary the next day. I ſtill continued to ſtir three times a-day for two days together, and then ſuffered it to reſt for two days more, perſuading myſelf that it was abſolutely ſpoilt. At the expiration of theſe four days, the liquor became of a red colour, but clearer than the paſtel vats. I ſtirred it once more, and let it ſtand ſix days longer: it had then a little froth, but very pale: ſix days afterwards the ſurface of the liquor became brown, and underneath a brown green. I ſtirred again, and fancied that the liquor underneath was ſtill reddiſh, though the froth which it threw up was of a good colour; I therefore conceived hopes that it would do, and that I ſhould be able to work it the next day.

" At the expiration of ſixteen hours I dipped ſome cotton, which took colour, but ſo very weak, that I was obliged to let it remain in the liquor ſeveral hours, till the blue became ſufficiently deep. It then withſtood the ſummer air and ſun tolerably well for 12 days; nevertheleſs, I had the vat thrown out as uſeleſs, on account of its tedious operation. Doubtleſs it might have been recovered with lime, or ſome other alkali that would have abſorbed the acid of the aqua-fortis, but it was not worth the pains. Beſides, the anſwer which I received from the perſon who ſent me the receipt from Rouen, contained an explanation with regard to the kind of aqua-fortis that ſhould be uſed; from which I learnt that it ſhould have been the ſoap-boiler's lixivium, which, inſtead of being acid, is one of the moſt cauſtic alkalies. In fact, by making uſe of this alkaline lixivium, the operation was attended with immediate ſucceſs, and never failed me ſince.

35 Of dyeing blue in ſmall quantities.

" I tried ſeveral of theſe different vats in miniature, in cucurbits, put into a water or ſand bath. Theſe laſt are attended with no difficulty; it is only neceſſary to diminiſh the quantity of the liquor, and of every ingredient, in proportion to your vat, and it is ſcarce poſſible it ſhould not ſucceed.

" Concerning that which I firſt deſcribed, and which is ſet hot, as it is attended with a little more difficulty, and ſeveral perſons may wiſh to try this operation themſelves, being rather curious, and requiring neither expence nor preparation in miniature; I will give the deſcription of a proceſs which ſucceeded extremely well, and which I purpoſely ſupplied with much more indigo than is generally done in the common method.

" I boiled two quarts of water with two drachms of madder, and four ounces of pearl-aſhes. When it had boiled a quarter of an hour, I poured it into a cucurbite, containing about a gallon, which was previouſly heated with hot water, in which I had put a quarter of a handful of bran. The whole being well ſtirred with a deal ſpatula, I put my cucurbite into a very moderate ſand heat, ſufficient only to keep it warm, or nearly of the ſame degree of heat requiſite in a common indigo vat.

"I continued the ſand heat all night and the next day, without perceiving any alteration. I ſtirred it only twice during the day with the ſpatula. The day following it produced an efflorеſcence, formed a coppery ſcum on the ſurface, and the liquor became a brown green. I then filled it with a mixture, compoſed of a quart of water, two ounces of pearl-aſhes, and a little bran. It was well mixed, and then left to ſettle. It became perfectly well coloured, and the next day I dyed ſeveral bits of woollen ſtuffs. Theſe vats are reheated and repleniſhed with as much eaſe as a great one."

36 Method of dyeing wool or woollen ſtuffs in any of theſe vats.

"After having prepared the vats according to any of the methods above mentioned, the dyeing any kind of woollen ſtuff is exceedingly eaſy; no other preparation for the dye being requiſite than ſimple immerſion in warm water, wringing them, and then dipping them in the vat for a longer or ſhorter time according to the deepneſs of the colour you wiſh to impart. From time to time the ſtuff ſhould be opened; that is, taken out and wrung over the vat, and expoſing it for a minute or two to the air till it becomes blue; for it muſt be obſerved, that in all the ſolutions of indigo or other materials hitherto deſcribed, the blue colour is produced by expoſure to the air alone, and the ſtuff is always taken out green, and will retain that colour if not expoſed to the air. In dyeing blue, therefore, it is neceſſary to let the colour change in this manner before you immerſe it a ſecond time, that the ſhade may be the better diſtinguiſhed; for dark blues require to be dipped ſeveral times, but it is dangerous to make this experiment with light blues. When a large quantity of wool is to be dyed, which cannot be put into the vat all at once, it very often happens that the quantity firſt put in will take up the deepeſt dye. To prevent this, ſome dilute their indigo-vat with a quantity of warm water; but M. Hellot diſapproves of this, as being apt to produce a fading colour. The beſt method, he ſays, is to dip them when the vat is nearly exhauſted; and for this purpoſe he recommends the paſtel-vat rather than any other: and though the colours produced in this manner are leſs bright than the others, they may be ſenſibly enlivened by paſſing the ſtuffs through boiling water. This, he ſays, is proper for all blue colours; as it not only renders the dye more fixed and bright, but cleanſes the ſtuffs from accidental impurities. After the work is taken out of the hot water, it is to be rinſed in a running ſtream. It will be ſtill more proper to full a dark blue ſtuff well with ſoap and water, and afterwards to rinſe it in running water; for the ſoap will be ſo far from injuring the colour, that it will thereby be rendered more bright and lively. Some dyers, in order to ſave the dearer ingredients of paſtel or indigo, make uſe of logwood; but this is by no means allowable, as the colour, though rather brighter than that of indigo, is exceedingly periſhable. In 1748, M. Macquer of the Royal Academy of Sciences diſcovered a method of dyeing ſilk and cloth with a preparation of Pruſſian blue, ſuperior to all the blues hitherto diſcovered. This, however, has never yet come into practice, nor is it at all probable that the colour of this pigment can ever be made to ſtand waſhing with ſoap. In all the methods in which we could try the experiment, it could not even bear waſhing with plain water. Indeed, when we conſider the great volatility of the colouring matter of Pruſſian blue, that it can only be fixed by iron, and that any alkaline matter will inſtantly diſengage it, and make it reſume its former volatility, there can be but very little hope of overcoming the difficulties which attend the proceſs.

37 M. Macquer's method of dyeing ſilk of a blue colour.

Having been ſo particular with regard to the preparation of the materials and method of dyeing wool, we need ſay the leſs concerning the method of dyeing ſilk or cotton. The following compoſition is recommended by M. Macquer. "To eight pounds of the fineſt indigo add ſix of the beſt pearl-aſh, from three to four ounces of madder for every pound of aſhes, beſides eight pounds of bran, waſhed in ſeveral waters to take out the flour. When waſhed, and moſt of the water ſqueezed out, it is placed alone at the bottom of the vat. The pearl aſh and the madder are then mixed, bruiſing them thoroughly together, and then boiling them for a quarter of an hour in a copper containing two thirds of the vat; the liquor is then ſuffered to reſt, and the door of the furnace ſhut.

"Two or three days previous to this, eight pounds of indigo are ſteeped in a bucket of warm water, waſhing it well, and even changing the water, which has a reddiſh caſt. Some begin with boiling the indigo in a ley of one pound of pearl-aſh with two buckets of water; after which they pound it while quite wet in a mortar; then while it is yet in a paſte, they fill the mortar with hot liquor which has been boiled before; letting it ſtand to ſettle for a ſhort time, and then pouring off the clear into a ſeparate boiler or into the vat. The ſame quantity of the mixture is then poured on the indigo which remained in the mortar, bruiſing and mixing it well, and then as before pouring it off into the boiler; which operation is repeated till the whole of the indigo is thus diſſolved in the liquor. That in the boiler is gradually poured into the vat upon the bran in the bottom, adding afterwards the remainder of the compoſition, grounds and all. After ſtirring and raking for ſome time, it is let ſtand, but without fire, till it becomes cool enough for the hand to bear. After this a little fire is to be put round the vat, only to preſerve the ſame degree of heat; and this ſhould be continued till the liquor becomes green, which is eaſily known by trying it with a little white ſilk. This ſhows that the vat is in a proper ſtate; but in order to be aſcertained of this, it will be neceſſary from time to time to ſtir it with a rake, when the brown and coppery ſcum which appears upon it after ſtanding for a little time ſhows that it is in a proper ſtate for working. Even in this caſe it is neceſſary to behave with the utmoſt caution, and to obſerve whether on blowing aſide the coppery ſcum juſt mentioned a freſh one appears or not; for if it does not, it is a ſign that the vat is not yet ready. If the ſcum appears, it muſt ſtand three or four hours, when a new compoſition is made to complete it. For this purpoſe as much water as is neceſſary to fill the vat is put into a copper, boiling it with two pounds of aſhes and four ounces of madder as at firſt. This new liquor is poured into the vat, raked and mixed, and then left to ſtand for four hours, when it is ready for dyeing.

The method of preparing ſilk for the blue dye is by boiling with ſoap, uſing 35 or 40 pounds of the latter to 100 of the former; but no impregnation with alum is required. Before dipping it in the vat, however, it ſhould be waſhed from the ſoap; and to cleanſe it more effectually, it ought to be twice beetled at the river, having been divided into hanks for the conveniency of wringing. After being dipped in the vat, it is to be wrung as hard as poſſible, and then opened out to the air, to give it the blue colour, as directed for wool; it ſhould then be immediately waſhed in two waters, and well wrung out again. Laſtly, it is to be dried as quickly as poſſible; cutting the thread which ties it, if the hanks are large, becauſe if kept tied it frequently turns red under the thread.

Silk dyed as above directed is apt to take the blue very unequally, and will moſt certainly do ſo, if not waſhed and dried immediately after dyeing. Fine dry weather is always beſt for theſe operations; for ſhould water accidentally fall upon it, it would be full of reddiſh ſpots. In moiſt weather, therefore, and during the winter, a room with a ſtove will be neceſſary. Different ſhades of blue are produced by dipping that firſt which is intended for the darkeſt colour.

38 Of dyeing cotton or linen blue.

The method of dyeing cotton or linen blue is ſo little different from that already deſcribed with regard to woollen or ſilk, that nothing farther needs be ſaid concerning it; only the colour upon cotton is generally leſs bright. M. de Apligny indeed tells us, that he has diſcovered a method of dyeing cotton velvets of a moſt beautiful and durable blue: but as he does not chooſe to communicate it, nothing can be ſaid on the ſubject. In the former edition of this work, a receipt was given for dyeing cotton of a very good blue colour, and which, as being inſtantaneouſly done, may occaſionally be uſeful. The indigo is diſſolved in a mixture of lime and potaſh (probably the pure cauſtic lixivium would anſwer fully as well); and after it is diſſolved, ſome raiſins beat into a pulp in a braſs or marble mortar are to be added. This very ſoon produces a copper-coloured ſcum at top; and the cotton being now dipped into the liquor receives the colour in an inſtant. Linen may be dyed in the ſame manner.

39 Of dyeing red colours.

The next of the primitive colours to be conſidered is red; of which there are many varieties: but the principal are ſcarlet, crimſon, and madder red. The dyeing of theſe colours differs conſiderably from that of the blues, becauſe they require a previous preparation in the ſtuffs to be dyed; and it is on this preparation that the goodneſs of the colour very often depends. Theſe preparations are generally alum, tartar, aquafortis, aqua-regis, or ſolution of tin in theſe acids. Galls and alkaline ſalts are alſo ſometimes added, tho' they do not of themſelves contribute any thing to the colour.

40 Venetian ſcarlet.

There are three kinds of ſcarlet, viz. that dyed with kermes, with cochineal, and with gum-lac. The firſt, called *Venetian ſcarlet*, is the leaſt bright, but more permanent, and leſs apt to be ſpotted than the others; inſomuch that in ſome pieces of tapeſtry done with this at Bruxelles in Flanders, it has ſcarce loſt any of its vivacity in 200 years. However, it is ſcarce ever uſed except for tapeſtry, and is dyed in the following manner, according to Mr Hellot.

" The wool ſhould be firſt drenched; for which purpoſe you put half a buſhel of bran into a copper, with a quantity of water ſufficient for 20 pounds of wool, which to the beſt of my knowledge is the uſual batch for one dyeing. In this liquor it ſhould boil for half an hour, ſtirring it from time to time; after which it is taken out and drained. I ſhall obſerve, once for all, that when you dye worſted, you put a rod through each ſkein, which commonly weighs about a pound, and which ſhould be kept on the rod during the whole proceſs, by which means the ſkein is prevented from tangling. It is alſo convenient for turning the ſkein, in order to dip each part, that the whole may be equally coloured; for which purpoſe, you raiſe it about half way out of the liquor; and holding the rod with one hand, you pull the ſkein with the other, ſo as to let the part which before was next the rod fall into the liquor. If the worſted ſhould be too hot for the fingers, it may be done by means of another rod. The equality of the colour depends ſo entirely upon the frequency of this manœuvre, that it cannot be too ſtrenuouſly urged. In order to drain them, you reſt the ends of the rods juſt mentioned on two poles; which ſhould be fixed in the wall over the copper.

" While the worſted is draining, after being thus drenched, you prepare a freſh liquor, viz. by throwing out what remained in the copper, and repleniſhing with freſh water; to this you add about a fifth part ſour water, four pounds of Roman alum groſsly pounded, and two pounds of red tartar. As ſoon as it boils, the worſted on the rods ſhould be immerſed for two hours, almoſt continually moving the rods, one after another, as I have before directed.

" It is neceſſary to obſerve, that after the alum is put in, when the liquor is ready to boil, it will ſometimes riſe ſuddenly out of the copper, if you do not mind to check the boiling by throwing in cold water. If, when it is ready to boil, you put in the cold worſted quickly, it will have the ſame effect. It is alſo proper to obſerve, that when dyers work in the great, they ſhould have their legs bare, that the hot liquor may not reſt in the ſtockings. When the quantity of tartar is rather conſiderable, as in the preſent operation, the liquor does not riſe ſo high; but when there is nothing beſides the alum, ſometimes, when it begins to boil, half of the liquor boils over, unleſs prevented by the above precautions.

" When the worſted has boiled in this liquor for two hours, drained, lightly ſqueezed, and put into a linen bag, it is depoſited in a cool place for five or ſix days, and ſometimes longer; this is called *leaving the worſted in the preparation*. This delay helps it to penetrate, and increaſes the action of the ſalts; for as a part of the liquor conſtantly evaporates, it is clear that what remains, being more impregnated with the ſaline particles, becomes more active, that is to ſay, provided there remains a ſufficient degree of moiſture; for the ſalts being once cryſtallized and dry, their power is deſtroyed.

" When the worſteds have remained in this ſtate for five or ſix days, they are then in a proper condition for being dyed. A freſh liquor is then prepared, according to the quantity of the worſted; and when it grows warm, if you want a full ſcarlet, you throw into it 12 ounces of pounded kermes to every pound of worſted; but if the kermes be ſtale, it will require pound for pound. When the liquor begins to boil, the worſted ſhould be put in, being ſtill moiſt; but if it has been ſuffered to grow dry after boiling, it ſhould be put into warm water, and well drained.

“ Before you put the wool into the copper with the kermes, it were adviſable to throw in a ſmall handful of refuſe wool, which, being boiled for a moment, imbibes a part of the blackneſs and droſs of the kermes; ſo that the wool afterwards dyed takes a much more beautiful colour. You now dip the ſkeins on the rods in the ſame manner as in the preparation, continually ſtirring them, and giving them air, from time to time, one after another. In this manner they ſhould be kept boiling for a full hour. They are then waſhed and drained.

“ If you would reap any advantage from the dye ſtill remaining in the liquor, you may dip a little prepared wool, which will take a colour in proportion to the goodneſs of the kermes, and to the quantity which had been put into the copper.

“ If you mean to dye a number of ſhades, one darker than another, you require much leſs of the kermes; 7 or 8 pounds being ſufficient for 20 pounds of prepared wool. You then dip the quantity of worſted intended for the lighteſt ſhade, leaving it in the copper no longer than neceſſary, in order to turn it, that it may imbibe the colour equally. It is then raiſed upon the pegs, and the next ſhade immediately put in, and ſuffered to remain for a longer time. You proceed in this manner to the laſt ſhade, which ſhould alſo remain till it has acquired the colour you deſire.

“ You begin with the lighteſt colour, becauſe if the wool was ſuffered to remain in the copper longer than neceſſary, it would be no loſs, provided you reſerve this batch for the darker ſhade: whereas, by beginning with the darkeſt, you would have no remedy in caſe of any accidental ſkip in the light ſhades. The ſame precaution is neceſſary in regular ſhades of all colours; but of the colour in queſtion theſe are ſeldom made, becauſe the dark ſhades are not much in uſe: and as the operation for all colours is the ſame, what I have ſaid reſpecting this will anſwer for all the reſt.

“ When the wool has been dyed in this manner, and before it is carried to the river, you may ſwill it in warm water, with a ſmall quantity of ſoap, well diſſolved; this adds a brightneſs to the colour; but, at the ſame time, gives it a little of the roſe, that is to ſay, a crimſon tinct.

“ In order to render this colour more bright and beautiful than common, I have tried a great number of experiments, but could not obtain a red equal to that produced by cochineal. Of all the liquors for the preparation of wool, that which ſucceeded the beſt was made according to the proportions I have mentioned. By changing the natural tinge of the kermes, by various kinds of ingredients, metallic ſolutions, &c. various colours may be obtained, which I ſhall preſently mention.

“ It is impoſſible to preſcribe any proportions for an ell of ſtuff, conſidering the infinite variety of their breadth, and even of their thickneſs, and the quantity of wool in their fabrication; experience is the beſt guide. Nevertheleſs, if you chuſe to be exact, the ſureſt way is to weigh the ſtuff to be dyed, and to diminiſh about one quarter of the colouring ingredients preſcribed for worſteds; becauſe the ſtuffs take internally leſs colour, as their texture, being cloſer, prevents it from penetrating; whereas the worſted or woollen fleece takes the colour internally as eaſily as on the exterior ſurface.

“ The alum and tartar, uſed in the preparation for ſtuffs, ſhould alſo be diminiſhed in the ſame proportion; neither is it neceſſary to let the ſtuffs remain in the preparation as long as the worſted: they may be dyed even the day after they had been boiled.

“ Woollen fleece dyed in the red of kermes, and to be afterwards incorporated in mixed cloth, or for the manufactory of thick cloths, will have a much finer effect than if dyed with madder.

41 Half-grain ſcarlet.

“ A mixture of half kermes and half madder, is called *ſcarlet in half-grain*. This mixture gives a colour extremely permanent; but not ſo lively, inclining rather to a blood colour. It is prepared and worked preciſely in the ſame manner as if kermes alone were uſed; only that in the liquor they put but half this grain, the other half is ſupplied by madder. This is conſequently much cheaper; and it frequently happens that the dyers who make it, render it much leſs beautiful than it might be, by diminiſhing the quantity of the kermes and increaſing that of the madder.

“ From the trials made on ſcarlet in grain, or ſcarlet of kermes, both by expoſing it to the ſun and by various liquors, it is proved that there does not exiſt a better nor a more laſting colour. It may for ſolidity be compared to the blues already mentioned. Nevertheleſs, the kermes is ſcarce ever uſed except at Venice; for ſince the fiery ſcarlets are become the taſte, this colour is almoſt entirely exploded. It has, notwithſtanding, many advantages over the other, as it neither blackens nor ſpots; ſo that ſhould the ſtuff get greaſed, the ſpot may be taken out without impairing the colour. Nevertheleſs, kermes is ſo little known to the dyers, that when I wanted a certain quantity for the above experiments, I was obliged to have it from Languedoc; the merchants of Paris encumber themſelves with no more than what they vend for the uſe of medicine.”

42 Cochineal ſcarlet.

The ſecond kind of ſcarlet, viz. that dyed with cochineal, is much more expenſive and leſs permanent than the other. For inferior uſes, ſuch as tapeſtry, the colour is ſometimes partly done with Braſil wood; but this colour cannot be made equally permanent with cochineal: and it is remarkable, that in whatever manner theſe fugitive colours be mixed with permanent ones, the latter never convey to them any portion of their durability, but, on the contrary, both go off together. The true cochineal ſcarlet is very difficult to dye in perfection, and almoſt every dyer has a receipt of his own for the purpoſe. The ſucceſs of the whole operation, however, according to Mr Hellot, depends upon the choice of the cochineal, the water uſed for dyeing, and the method of preparing the ſolution of tin, which is now univerſally known to be the only ingredient by which a ſcarlet colour can certainly be produced. The following is his receipt for the preparation of this liquid, which from his own experience he gives as the beſt. To eight ounces of ſpirit of nitre add as much river water, diſſolve in the mixture gradually half an ounce of very white ſal-ammoniac, in order to make an aqua regia, to which add two drachms of purified ſalt-petre. This laſt ingredient, he owns, might be omitted; but he is perſuaded that the uſe of it contributes to make the colour more uniform. In the liquor thus prepared diſſolve an ounce of Engliſh tin reduced into grains by dropping it, when melted, into a baſon of cold water. Theſe are to be dropped into the liquor one by one, waiting for the diſſolution of the firſt before we add a ſecond, in order to preſerve a quantity of red vapours, which are the phlogiſticated nitrous acid; and to the mixture of which he ſuppoſes the beauty of the colour is partly owing. The ſolution prepared in this manner is of the colour of ſolution of gold; and if fine tin be made uſe of, there is neither black duſt nor ſediment of any kind to be ſeen in it; but though tranſparent when juſt made, it is apt to become milky with the heats of ſummer; which, however, is no detriment to it in our author's opinion: and it is certainly juſt, if the tranſparency returns with the coolneſs of the ſolution. The aquafortis or ſpirit of nitre uſed for this purpoſe ought to be ſuch as will diſſolve half its weight of ſilver: and by following this method you will always be certain of having a compoſition of an equal ſtrength; ſo that any ſlight difference which may ariſe from the quality of the cochineal will ſcarce be perceived. A weak ſolution makes the ſcarlet incline towards crimſon, and a ſtrong one towards orange.

43 Preparation of worſted for the ſcarlet dye.

When worſted is to be prepared for the ſcarlet dye, the following operation is neceſſary. For every pound of the ſtuff, ten gallons of clear river water are to be put into a ſmall copper; and when it becomes pretty hot, two ounces of cream of tartar, and a drachm and an half of cochineal, both finely ſifted, are to be added. A briſk fire is to be kept up; and when the liquor is ready to boil, two ounces of the compoſition already deſcribed muſt be added, by which the liquor is immediately changed from crimſon to blood colour. As ſoon as it begins to boil, the worſted, previouſly ſteeped in hot water, and then expreſſed, is to be added. It muſt be ſuffered to boil for an hour and an half; after which it is taken out, gently ſqueezed, and waſhed in cold water, having taken care to ſtir it conſtantly all the time. It will now be a tolerable fleſh colour, or even ſomewhat darker, according to the goodneſs of the cochineal and the ſtrength of the ſolution of tin; but the colour will be ſo totally abſorbed by the ſtuff, that the remaining liquid will be almoſt as colourleſs as water. This is called the *ſcarlet boiling;* and without this the dye would not hold. To finiſh the dye there muſt be another preparation of very clear water, the goodneſs of this being of the utmoſt conſequence to the goodneſs of the colour. In this preparation, along with the other ingredients, there muſt be half an ounce of ſtarch; and when the liquor is pretty hot, ſix drachms and an half of cochineal, likewiſe finely powdered, is to be added. A little before it boils, two ounces of the ſolution of tin are put in; by which, as in the former caſe, the colour is inſtantaneouſly changed. As ſoon as it begins to bubble, the worſted is to be dipped, allowed to boil an hour and an half, ſtirring it all the time, and then waſhing it as already directed. An ounce of cochineal will be ſufficient to give a proper depth of colour to a pound of wool; a drachm or two more might be added, if you would have the colour very deep, but if it be much enlarged, the dye will turn out very dull.

44 Proper material for the cauldron.

In dyeing the ſcarlet colour, the material of which the cauldron is made is by no means a matter of ſmall conſequence. On this our author has the following obſervations. "Their cauldrons in Languedoc are made of fine tin. They are alſo uſed by ſeveral dyers at Paris; but Mr Julienne, whoſe ſcarlet is very highly eſteemed, makes uſe of braſs cauldrons. Theſe are alſo uſed in the dyeing manufactory of St Dennis. Mr Julienne is careful only to ſuſpend a large pack-thread net, with pretty ſmall meſhes, in his cauldron, to prevent the ſtuff from touching. At St Dennis, inſtead of a net, they uſe a large open wicker baſket; but this is leſs convenient than the net, becauſe it requires a man at each ſide of the copper to keep it even, and to prevent it, when loaded with the ſtuff, from riſing to the ſurface of the liquor.

45 Experiment of M. Hellot on this ſubject.

"This practice, ſo different with regard to the materials of the cauldron, determined me to make an experiment. I took two ells of white Sedan cloth, which I dyed in two cauldrons, one of copper, furniſhed with a pack-thread net, and another of tin. I weighed the cochineal, the compoſition, and other ingredients, with as much accuracy as poſſible. They boiled exactly the ſame time. In ſhort, I was ſufficiently attentive to make the operation the ſame in every particular; that in caſe of any perceptible difference it could only be attributed to the different materials of the cauldrons. At the firſt boiling, the two patterns were abſolutely alike, except that the piece done in the tin cauldron was rather more marbled, and not quite ſo even as the other; but this in all probability might be occaſioned by their not having been equally cleanſed at the mill. I finiſhed each piece in its proper cauldron, and they were both of them very beautiful. Nevertheleſs, it was very evident that the cloth which had been dyed in the tin was more fiery, and the other rather more crimſoned. They might have been eaſily brought to the ſame ſhade; but this was not my object. From this experiment, it appears that, with a copper cauldron, the quantity of the compoſition ſhould be increaſed; but then the cloth grows harſh to the feel. Thoſe who dye in copper, to prevent this evil add a little of the turmerick, which is a drug only uſed for falſe colours, and therefore prohibited by the regulations to dyers in grain, but which gives ſcarlet that dazzling fiery colour ſo much the faſhion at preſent. It is, however, if you have any ſuſpicion, eaſy to diſcover the deception, by cutting the pattern with a pair of ſciſſars. If it has no turmerick, the cut edge will appear white, otherwiſe it will be yellow. When the cloſe texture is equally dyed with the ſuperficies, let the colour be what it will, they ſay the colour *cuts*, and the contrary when the middle of the texture remains white. Legitimate ſcarlet never cuts. I call it *legitimate*, and the other falſe, becauſe that with the addition of the turmerick is more liable to fade. But as the taſte for colours is ſo variable, as the bright ſcarlets are at preſent the mode, and as it is neceſſary, in order to pleaſe the buyer, that it ſhould have a yellow caſt, it were better to authoriſe the uſe of the turmerick, though a falſe colour, than to allow too large a quantity of the compoſition, by which the cloth is injured, being more liable not only to dirt, but alſo to tear, as the fibres of the wool are rendered brittle by the acid.

“ I muſt alſo add, that a copper cauldron ſhould be kept extremely clean. I have myſelf frequently failed in ſcarlet patterns by neglecting to clean the cauldron. I cannot in this place forbear condemning the practice even of ſome eminent dyers, who at about ſix o'clock in the evening make their preparation in a copper cauldron; and, in order to gain time, keep it hot till day-light the next morning, when they dip their ſtuffs. The preparation muſt undoubtedly corrode the copper during the night; and conſequently, by introducing coppery particles into the cloth, injure the ſcarlet. They will tell us that they do not put in the compoſition till immediately before the cloth is dipped: but this is no apology; for the cream of tartar added on the preceding evening being ſufficiently acid to corrode the copper, forms a verdigris which diſſolves, it is true, as ſoon as it is formed, but which nevertheleſs produces the ſame effect.

46
How to preſerve a tin cauldron from melting.

“ As tin is abſolutely neceſſary in the ſcarlet dye, it were much better to have a cauldron of this metal, which would infallibly contribute to the beauty of the colour. But the price of theſe cauldrons, if ſufficiently large, is an object of conſideration, eſpecially as they may melt in the firſt operation if not carefully attended to by the workmen. Beſides, it would be very difficult to caſt a veſſel of ſo large a ſize without flaws that would require to be filled. It is abſolutely neceſſary that they be made of block tin. If the flaws ſhould be filled with ſolder, which contains a mixture of lead, many parts of the cauldron will retain the lead, which being corroded by the acid compoſition will tarniſh the ſcarlet. Hence there are inconveniences in every particular: nevertheleſs, if it were poſſible to procure a ſkilful workman capable of caſting a cauldron of the Melac tin without flaw, it were certainly preferable to every other; for though the acid of the compoſition ſhould in ſome parts corrode it, the detached particles will do no harm, as I have already obſerved.

“ There is no danger of melting a tin cauldron, but when it is emptied in order to fill it with a freſh liquor. I ſhall therefore add the precautions neceſſary to prevent this evil. In the firſt place, the fire ſhould be taken entirely from the furnace, and the remaining embers quenched with water. Part of the liquor ſhould then be taken out with a bucket, while the remainder ſhould be daſhed about with a ſhovel by another perſon, in order to keep the upper part of the cauldron continually moiſt, at the ſame time cooling what remains in the cauldron with cold water. In this manner it ſhould be continued till you can touch the bottom without being burnt. It ſhould then be entirely emptied, and all the ſediment taken up with a moiſt ſponge. This attention will preſerve your cauldron.

47
Why wool in fleece is never dyed ſcarlet.

“ Woollens are never dyed ſcarlet in the fleece, for the two following reaſons: The firſt is, or ought, to regard all ſtuffs of ſimply one colour; thoſe of many colours are called *mixed ſtuffs*. Theſe kind of ſtuffs are never dyed in the wool, eſpecially when the colours are bright and fine; becauſe, in the courſe of the fabrication, the ſpinning, twiſting, or weaving, it would be almoſt impoſſible to prevent ſome white or other coloured wool from mixing, which though ever ſo trifling would injure the ſtuff. For which reaſon, reds, blues, yellows, greens, or any of thoſe unmixed colours, ſhould not be dyed till after they have been manufactured. The ſecond reaſon is peculiar to ſcarlet, or rather to the cochineal, which being heightened by an acid, cannot ſtand the fulling without loſing much of its colour, or being at leaſt exceſſively crimſoned. For the ſoap which contains an alkaline ſalt deſtroys the vivacity produced by the acids. Hence it is evident that neither cloth nor ſtuffs ſhould be dyed ſcarlet till they have been fulled and dreſſed.

“ To dye different pieces of cloth at the ſame time, the directions already given do not entirely anſwer.

48
Directions for dyeing different pieces of cloth at the ſame time.

“ For example, in order to dye five pieces of Carcaſſionne cloth at the ſame time, each piece five quarters broad, and fifteen or ſixteen ells in length, it is neceſſary to obſerve the following proportions: You begin by making the compoſition in a very different manner from the preceding proceſs, *viz.* twelve pounds of aquafortis put into a ſtone jar or glazed veſſel, with twenty-four pounds of water, and one pound and an half of tin grains added. The ſolution goes on more or leſs ſlow according to the acidity of the aquafortis, and ſhould ſtand for twelve hours at leaſt. During this time a kind of blackiſh dirt falls to the bottom; the top ſhould be then drained off the ſediment: this liquor is of a clear lemon colour, and is preſerved by itſelf. This proceſs evidently differs from the firſt by the quantity of water mixed with the aquafortis, and by the ſmall portion of tin, of which ſcarce any remains in the liquor; for the aquafortis not being in itſelf a ſolvent for tin, only corrodes and reduces it to a calx, provided neither ſaltpetre nor ſal ammoniac be added, which would convert it into an aqua regia. The effect of this compoſition is not, however, different from others, and is perceptible to thoſe who from experience are competent judges of this colour. The compoſition without ſal ammoniac has been for a long time uſed by the manufacturers of Carcaſſionne, who doubtleſs imagined that its effect was owing to a ſuppoſed ſulphur of tin, and may be preſerved from putrefaction for thirty hours in winter and only twenty-four in ſummer. It then grows turbid, forms a cloud, which falls to the bottom of the veſſel in a white ſediment. This ſediment is a ſmall portion of the tin, which was ſuſpended in an acid not prepared for the ſolution. The compoſition, which ought to be yellow, becomes clear as water; and if employed in this ſtate never ſucceeds, but produces the ſame effect as if it had been milky.

“ When the compoſition is prepared, as I have now deſcribed, according to M. de Fondieres, you put, for the quantity of cloth laſt mentioned, about ſixty cubic feet of water into a large copper; when the water grows warm, you add a ſackful of bran: it is ſometimes neceſſary to uſe ſour water; they will either of them do, as they ſay, to correct the water, *viz.* to abſorb the terreous and alkaline ſubſtances, which crimſon the tinge of the cochineal. We ſhould be well informed concerning the nature of the water employed, in order to know whether theſe correctives be neceſſary.

"Be it as it may, when the water is a little more than warm, you add ten pounds of cryſtals or cream of tartar pulveriſed, that is to ſay, two pounds to each piece of cloth. The liquor ſhould be then violently ſtirred; and, when rather hot, you ſhould put into it half a pound of the powder of cochineal, mixing it well together, and immediately afterwards you pour into it twenty-ſeven pounds of the compoſition, very clear, which alſo requires to be well ſtirred. As ſoon as it begins to boil, the cloth being immerſed, ſhould boil very faſt for two hours, and during that time ſhould be kept in continued motion on the wynch, and when taken out paſſing it through the hands by the liſting, in order to open and give it air. It is afterwards carried to the river and well waſhed.

49 Method of ſtirring the cloth.

"In order perfectly to underſtand the method of ſtirring the cloth, it is requiſite to obſerve, that a kind of reel or wynch, with a handle for turning, ſhould be placed horizontally on the iron hooks which are fixed in the felloes that ſupport the edge of the cauldron. You firſt join the ſeveral ends of each piece of ſtuff to be dyed at the ſame time; and as ſoon as they are immerſed, you carefully keep the end of the firſt piece in your hand; you then lay it on the reel, which ſhould be turned till the end of the laſt piece appears. It is then turned the contrary way, and in this manner every piece will be dyed as even as poſſible.

"When the cloth has been well waſhed, the cauldron ſhould be emptied, freſh liquor prepared, to which you muſt add, if neceſſary, a ſack of bran or ſome ſour water; but if the quality of the water be very good, there is no occaſion for any addition. When the liquor is ready to boil, you put in eight pounds and a quarter of cochineal pulveriſed and ſifted. The whole is then mixed together as even as poſſible; but when you ceaſe to ſtir, you muſt mind when the cochineal riſes to the ſurface, forming a kind of ſcum of the colour of lees of wine. As ſoon as this ſcum begins to divide, you pour in eighteen or twenty pounds of the compoſition. You ſhould have a veſſel full of cold water near the cauldron ready to throw in, leſt after putting in the compoſition it ſhould riſe above the edge, as is ſometimes the caſe.

"When the compoſition is put into the copper, and the whole well mixed, you turn the wynch quick for two or three turns, that every piece may imbibe the cochineal equally. It is then turned more ſlowly, in order to let the water boil. It ſhould boil very faſt for two hours, conſtantly turning and keeping the cloth down with a ſtick. The cloth is then taken out, and paſſed through the hands by the liſting, in order to give it air and to cool it; it is afterwards waſhed at the river, dryed, and dreſſed.

"There is a conſiderable advantage in having a great quantity of ſtuff to dye at the ſame time; as for example, when the five firſt pieces are finiſhed there remains a certain quantity of the cochineal, which, ſuppoſing ſeven pounds at firſt, might amount to twelve ounces; ſo that cloth put into this ſecond liquor will imbibe the ſame ſhade of roſe-colour as if you had coloured a freſh liquor with twelve ounces of cochineal. The quantity remaining may, however, vary very much according to the quality of the cochineal, or according to the fineneſs of the powder. Though the quantity of colour remaining in the liquor may be very inconſiderable, it nevertheleſs deſerves attention on account of the dearneſs of this drug. Of this liquor, therefore, a preparation may be made for five pieces of cloth; and it will require leſs of the cochineal and leſs of the compoſition, in proportion, as near as you can gueſs, to the quantity remaining in the liquor. This is alſo a ſaving of fuel and time; but it is impoſſible to give poſitive directions concerning this manœuvre, which muſt be left to the ingenuity of the dyer; for having dyed roſe-colour after the ſcarlet, you may make a third preparation, which will dye a fleſh-colour. If there is not time to make theſe two or three preparations in 24 hours, the liquor ſpoils: ſome dyers put Roman alum into the liquor to prevent it from ſpoiling; but this changes it to a crimſon.

50 Scarlets crimſoned by alum.

"Scarlets thus crimſoned in the ſame liquor in which they had been dyed, are never ſo bright as thoſe done in a freſh liquor. Drugs which reciprocally deſtroy each other's effect are more efficacious when employed in ſucceſſion.

"When you dye cloth of different qualities, or any kind of ſtuffs, the beſt method is to weigh them, and for every hundred pound to allow about ſix pounds of cryſtals or cream of tartar, eighteen pounds of the compoſition in the preparation, the ſame quantity in the completion, and in each of them ſix pounds and a quarter of cochineal. For the accommodation of thoſe who would make ſmall experiments, the whole may be reduced, viz. one ounce of cream of tartar, ſix ounces of the compoſition, and an ounce of cochineal for every pound of ſtuff. Some of the Paris dyers ſucceed very well by putting two-thirds of the compoſition and a quarter of the cochineal in the preparation, and the remaining third of the compoſition, and the other three-quarters of the cochineal, to the completion.

"It is not the cuſtom to put cryſtal of tartars in the finiſh: I am however convinced by experience that it does no harm, provided that at moſt you put but half the weight of the cochineal; and in my opinion it made the colour rather more permanent. There have been dyers who have dyed ſcarlet at three times: in this caſe they had two preparations, and afterwards the finiſh; but they always uſed the ſame quantity of drugs."

We have already obſerved, that the kermes were ſo little uſed for brown or Venetian ſcarlets, that theſe kind of colours were made with cochineal. For this purpoſe the preparation is made as uſual; and for the dyeing they add to the liquor eight pounds of alum to every hundred weight of ſtuff. This alum is diſſolved in a ſeparate cauldron with a ſufficient quantity of water: it is thrown into the liquor before the cochineal. The remainder is done preciſely the ſame as in common ſcarlet: it gives the cloth the colour of Venetian ſcarlet; but it is not by any means ſo permanent as the colour obtained from kermes.

There are no alkaline ſalts that do not crimſon ſcarlet; but it is more generally the cuſtom to uſe alum, becauſe theſe alkaline ſalts are no addition to the permanency of the colour, and may poſſibly injure the ſtuffs, becauſe all animal ſubſtances are diſſolved by fixed alkalies. The alum, by being deprived of its phlegm by calcination, will more certainly crimſon. The liquor which had been uſed for crimſoning is red, and ſtill redder in proportion as the ſcarlet is more crimſoned, ſo that the colours part with much of their baſis in the liquor by which they are darkened. It is, however, impoſſible to darken in grain without ſalts. The late Mr Barron, in a memoir which he preſented to the Royal Academy of Sciences 12 or 15 years ago, remarks, that he ſucceeded better with the ſalt of urine, than with any other ſalt, for uniting the colour and preſerving its brightneſs and fulneſs; but, as he obſerved, it is very inconvenient to make any quantity of this ſalt.

51
Quality of the water uſed in ſcarlet of great importance.

It has been obſerved, that the choice of the water for dyeing ſcarlet was of importance; the greateſt part of the common waters ſadden, becauſe they almoſt always contain a quantity of ſtony or calcareous earth, and ſometimes of ſulphureous or vitriolic acid. Theſe are commonly called hard waters; by this term they mean water that will not diſſolve ſoap, and in which it is not eaſy to dreſs vegetables. By abſorbing or precipitating theſe heterogeneous ſubſtances, all waters are rendered equally good. If the matter be alkaline, a little ſour water will produce this effect. Five or ſix cubic feet of this ſour water, added to 60 or 70 cubic feet of other water before it has boiled, will cauſe the alkaline earth to riſe in a ſcum which may be eaſily taken off the liquor. A ſackful of any kind of white mucilaginous root cut in ſmall bits, or, if dry, powdered, will alſo, if the ſack be left to ſoak in the water for a half or three-quarters of an hour, correct a doubtful water; bran, as we have ſaid above, will alſo anſwer the ſame end tolerably well.

52
Of gum-lac ſcarlet.

The ſcarlet produced by gum-lac, though leſs bright than cochineal, has the advantage of being more permanent. The lac moſt eſteemed for dyeing is of a branched form. The colour is that of an animal, like that of cochineal and kermes, and the branched kind has moſt of the animal particles in it. The beſt kind is of a blackiſh brown colour on the outſide, and red within; and from ſome experiments made by M. Geoffroy, it appears to be a kind of comb, ſomewhat reſembling that made by bees or other inſects of that kind. Dyers ſometimes uſe it when pulveriſed, and tied up in a bag; but to this M. Hellot objects, becauſe ſome of the gum-reſin being melted by the heat of the boiling liquid, eſcapes through the cloth, and adheres to it ſo cloſely, that it muſt be ſcraped off with a knife when cold. Others endeavour to extract the colour by boiling it in water after it has been reduced to powder, and then letting it ſtand to ſettle, and pouring off the coloured liquid; but in this way it often turns putrid.

53
M. Hellot's method of extracting the colour of gum-lac.

M. Hellot, therefore, after ſeveral unſucceſsful trials to extract all the colour readily, had recourſe at laſt to mucilaginous roots; which, without communicating any colour of their own, retained that of the lac ſo effectually as to remain with it upon the filtre. Comfrey-root was that with which he ſucceeded beſt. For extracting the colour, he uſed it dried and powdered, in the proportion of half a drachm to a quart of water. In this it is to be boiled for a quarter of an hour; then ſtrained through a linen cloth, and poured while quite hot upon the gum-lac powdered and ſifted through an hair-ſieve. By this it immediately acquires a fine crimſon colour; after which the whole is ſet to digeſt in a moderate heat for twelve hours, ſtirring the gum which remains at the bottom ſeven or eight times. The water thus impregnated with the colour is afterwards decanted into a veſſel large enough to contain four times the quantity, which is then to be filled with cold water. A ſmall quantity of ſtrong ſolution of Roman alum is then added; the coloured mucilage ſubſides; and if any colour remains in the liquor, it may be precipitated by the addition of ſome more alum, until at laſt the water will be left entirely colourleſs. After the crimſon mucilage is entirely ſunk to the bottom, the clear water is drawn off with a ſyphon, and the remainder put upon a filtre, to let the liquid ſlowly drop off or evaporate. If the whole of the colour be not extracted from the lac by one operation, it is to be repeated till no more appears, and the reſiduum becomes of a pale ſtraw-colour. The beſt lac, detached from its branches, does not yield more than one-fifth of its weight in colour; and hence there is no great advantage to be made by ſubſtituting it in place of cochineal for the ſcarlet dye.

54.
Method of uſing the extract of gum-lac.

For dyeing ſcarlet with this extract of gum-lac, the requiſite quantity of it, dried and powdered, is to be put into an earthen or block-tin veſſel. Some hot water is then to be poured upon it; and, when well moiſtened, add the proper quantity of the ſcarlet compoſition, ſtirring the mixture with a glaſs peſtle. By this means the powder, which before was of a dark dirty purple, acquires an exceedingly bright ſcarlet. The ſolution in which the cryſtals of tartar had been previouſly diſſolved is then to be poured into the liquor; and as ſoon as the latter begins to boil, the cloth is to be dipped into it, turning it over and over according to the common method. The remainder of the operation is to be performed in the ſame manner as if cochineal were uſed. The extract, in our author's opinion, afforded about a ninth part more colour than cochineal.

55.
Of dyeing crimſon.

Crimſon is the colour produced by cochineal with alum and tartar only, without any ſolution of tin. For this colour two ounces and an half of alum, with an ounce and an half of white tartar, are to be taken for every pound of wool. Theſe being put into a cauldron with a proper quantity of water, are to be made to boil before the ſtuff is put in. As ſoon as the liquor begins to boil, the wool is to be put into the cauldron, and the boiling continued for two hours; after which it is to be taken out, gently ſqueezed, rinſed in water, and put into a bag, which is alſo neceſſary to be done with the preparations for every other colour. A freſh liquor muſt be prepared for the dye, in which an ounce of cochineal is to be put for every pound of wool. When it begins to boil, the wool is to be put in, and managed as already directed for ſcarlet. For the fineſt crimſon, the ſtuff, after the common proceſs is finiſhed, ſhould be dipped in a new liquor in which a ſmall quantity of ſal ammoniac is to be diſſolved, and an equal quantity of potaſh added after it is pretty hot.

A very beautiful crimſon is obtained by boiling the wool as for common ſcarlet, then making a ſecond preparation with two ounces of alum, and an ounce of tartar to every pound of wool. It ſhould remain an hour in this decoction. A freſh liquor is then to be prepared immediately; in which to every pound of wool you put ſix drachms of cochineal. When it has remained an hour in this liquor, it is taken out and immediately dipped in a ſolution of barilla and ſal ammoniac;

moniac; and in this manner a great number of very beautiful ſhades of crimſon may be prepared by diminiſhing the quantity of cochineal. In this proceſs it is neceſſary that the mixture of alkaline ſalt and ſal ammoniac ſhould not be too hot, as this would cauſe the volatile ſpirit evaporate too quickly, and the cryſtals of tartar alſo, being neutraliſed, would loſe their effect.

50 Of dyeing ſilk of a crimſon colour.

For dyeing ſilk of a fine crimſon with cochineal, M. Macquer recommends only 20 pounds of ſoap to 100 of ſilk; "becauſe (ſays he) the little natural yellow ſtill remaining in the ſilk, after only this quantity of ſoap, is favourable to the colour.

"Having waſhed and beetled the ſilk at the river to diſcharge it well of the ſoap, it is put into a very ſtrong ſolution of alum, where it ſhould remain generally from night till the next morning, about ſeven or eight hours. The ſilk is then waſhed and twice beetled at the river; during which time the following liquor is thus prepared:

"You fill a long boiler about one-half or two-thirds full of river water; when this water boils, you throw in ſome white nutgalls pounded, letting it boil a little longer, about a quarter of an ounce to two ounces for every pound of ſilk. If the nutgalls are well pounded and ſifted, they may be put in at the ſame time with the cochineal.

"The ſilk being waſhed, beetled, and diſtributed upon the rods, you throw into the liquor the cochineal, carefully pounded and ſifted; it muſt be then well ſtirred with a ſtick, and afterwards boiled. You may put from two to three ounces for every pound of ſilk, according to the ſhade required. For the moſt common crimſon colours two ounces and an half is ſufficient, it being ſeldom neceſſary to uſe three ounces except for ſome particular match.

"When the cochineal has boiled, you add to the liquor for every pound of cochineal about an ounce of the ſolution of tin in aqua regia; it is called *compoſition*, and made in the following manner:

"One pound of the ſpirit of nitre, two ounces of ſal ammoniac, and ſix ounces of fine tin in grains: the two laſt are put into an earthen pot of a proper ſize; twelve ounces of water is then poured on it, the ſpirit of nitre afterwards added, and the whole left to diſſolve.

"This compoſition contains much more tin and ſal ammoniac than is uſed for the ſcarlet of cochineal on wool; it is however abſolutely neceſſary.

"This quantity of the compoſition ſhould be well mixed and ſtirred in the liquor, and the copper then filled with cold water, about eight or ten quarts to every pound of fine ſilk; coarſe ſilk requiring leſs, as it occupies leſs ſpace. The liquor is then fit to receive the ſilk which is immerſed, and returned till it appears uniform, generally requiring about five or ſix returns. The fire is then ſtirred; and whilſt the liquor is boiling, which it ſhould do for two hours, the ſilk is returned from time to time. The fire is then taken from under the copper, and the ſilk put to ſoak in the ſame manner as for aluming. It ſhould remain for five or ſix hours, or even, if the liquor be ready at night, till the next morning. It is then taken out, waſhed at the river, twice beetled, wrung as uſual, and put on the perches to dry.

"To ſadden the grain of ſcarlets, the ſilk when taken out of the cochineal liquor is waſhed and twice beetled at the river; the water-liquor is then prepared, in ſummer as it is, but in winter a little warmed, adding a ſolution of copperas, more or leſs according to the darkneſs of the ſhade required. The ſilk ſhould be returned in this liquor, in ſmall hanks, till it becomes very even; and when the ſhade is equal to expectation, ſhould be taken out, wrung and put to dry without waſhing if you like, becauſe the copperas liquor is little more than clean water. The copperas gives the cochineal a violet tinct, depriving it of its yellow. If, however, it ſhould appear to loſe too much of its yellow, it may be preſerved by adding to the copperas liquor a little of the decoction of fuſtic. Nothing but copperas will ſadden grain ſcarlets; the logwood being quite uſeleſs for this purpoſe, copperas alone will ſuffice, as it darkens greatly with the nutgalls uſed in grain ſcarlets.

"The proceſs juſt related for producing this colour is the moſt in uſe at preſent, as it gives a more beautiful ſhade than can be obtained by any other method. Nevertheleſs, as many dyers proceed in the old way, we ſhall deſcribe it here.

"For theſe grain ſcarlets the round paſte, as imported from the Indies, is added in the boiling of the ſilk. When the ſoap boils, about an ounce of rocou is bruiſed in the cullender, in the ſame manner as deſcribed for orange-colours. It ſhould be pounded as fine as poſſible, leſt any lumps ſhould remain and ſtick to the ſilk.

"This ſmall quantity of rocou, in the boiling of the ſilk, has the ſame effect as the compoſition, yellowing a little. The remainder of this proceſs is juſt the ſame as the preceding; but without the addition of either compoſition or tartar.

"The ſilk dyers are accuſtomed to uſe only the fineſt cochineal, and even always prefer the prepared cochineal, which is cleanſed from all its impurities, ſifted and picked. This is certainly commendable, conſidering that the cochineal not prepared being leſs pure, the more of it muſt be added, and that the dregs remaining in the liquor may injure the colour. The white tartar uſed in grain ſcarlets ſerves to exalt and yellow the colour of the cochineal, producing this effect by its acidity, all acids having the ſame effect: we muſt, however, obſerve, that tartar is preferable, as it gives a more beautiful tinct. But, notwithſtanding the quality of the tartar, it is ſtill incapable of exalting the colour of the cochineal ſufficiently to produce a grain ſcarlet, whatever quantity may be added if employed by itſelf: for if the doſe of this ingredient be moderate, it will not yellow enough; and if too large, it deſtroys and degrades the colour, without any good effect. In order to aſſiſt the tartar, it will be neceſſary to add ſome of the compoſition, which, as we have ſeen, is nothing more than a ſolution of tin in aqua regia. This ſolution with cochineal, when uſed for dyeing of worſted, has a conſiderable effect, changing it from a crimſon, its natural colour, to a prodigious bright fire colour; and produces only a crimſon when applied to ſilk: but it gives this colour a very beautiful tinct; for uniting with the tartar, it augments the effect without impoveriſhing the colour, ſaving the rocou ground, as we have before obſerved.

57 Uſe of nutgalls in dyeing ſilk of a crimſon colour.

“ As to nutgalls, they produce no good effect with regard to colour: on the contrary, if you uſe too much, they tarniſh to a degree, entirely ſpoiling the colour; nevertheleſs, it is always the cuſtom to put the quantity we have ſpecified.

“ One might probably conjecture from the introduction of this practice, that ſcarlets were formerly produced with cochineal, without either tartar or compoſition, yellowing only with rocou: ſilk dyed in this manner, however, would have no ruſtling, ſo that it could not be diſtinguiſhed from ſilk dyed with Braſil wood. Nutgalls, on account of their concealed acid, having the property of giving the ſilk a great ruſtling, are therefore added with cochineal; by which means theſe ſcarlets are diſtinguiſhed by the feel from the ſcarlet of Brazil wood: for we muſt obſerve, that the Braſil dye cannot ſtand the action of the nutgalls, by which it is entirely deſtroyed.

“ But beſides giving this ruſtling to the ſilk, it has at the ſame time the ſingular and very remarkable quality of adding to its weight very conſiderably; ſo that by putting one ounce of nutgalls to every pound of ſilk, you add two or two and a half *per cent.* to the weight: by this means ſome ſilk-dyers add even ſeven or eight *per cent.* They are ſo much accuſtomed to this advantage in weight, owing to the nutgalls, that even when this drug becomes uſeleſs by the addition of the tartar and compoſition, which produces the ſame ruſtling, they make it ſtill neceſſary on account of the weight, which is not proportionably increaſed by the other acids. White nutgalls are always preferable to the black, as they injure the colours much leſs. We may, however, hence conclude, that for grain ſcarlets nutgalls are not only uſeleſs but very prejudicial; and ſerving only as an impoſition, is a blameable practice, and injurious to commerce.

“ The ſilk is thus ſuffered to remain in the liquor, in order to make it wholly imbibe the cochineal. During this repoſe it takes a good half-ſhade; and the colour yellowing in proportion, gives it a much finer caſt.

“ One would be apt to believe, that leaving the ſilk to boil in the liquor for a longer time would have the ſame effect; but experience proves the contrary: beſides, it would be more expenſive, conſidering that it would be neceſſary to continue the fire.

“ The cochineal leaves on the ſilk, when taken out of the liquor, a kind of ſcale, or rather the ſkin of the inſect, which always contains a portion of the colouring juice. In order, therefore, to cleanſe the ſilk perfectly from this kind of bran, it is twice beetled when waſhed at the river. By this means the colour becomes more brilliant, clearer, and fuller.

“ The two beetlings before dyeing are neceſſary, becauſe the ſilk having been ſtrongly alumed for this colour, and intended to boil in the dyeing liquor for a great while, would, without this precaution, yield a certain quantity of the alum, which not only injures the colour, but likewiſe prevents the perfect extraction of the cochineal; for generally all neutral ſalts added to the dyeing liquor have more or leſs this inconvenience.

“ The grain, or cochineal crimſon, ſuch as deſcribed, is not only a very beautiful, but may be conſidered as a moſt excellent colour: it is the moſt permanent of all dyes for ſilk. It perfectly reſiſts the boiling with ſoap, and evidently ſuffers no alteration from either the ſun or the air. Silk ſtuffs of this colour, commonly uſed in furniture, are ſooner worn out than faded. It is frequently ſeen that the colour of this grain crimſon in furniture, though more than 60 years old, is ſcarce impaired. The only obſervable difference occaſioned by time is, that by loſing the yellow caſt it becomes rather darker, approaching nearer to the violet.”

58 Of dyeing cotton of a red colour.

The dyeing of cotton red is attended with much more difficulty than any of the ſubſtances hitherto mentioned; and indeed to produce a good ſcarlet or crimſon upon it has hitherto been a deſideratum in the art. The following are M. Apligny's directions for dyeing ſuch reds as are commonly in uſe. “ It is neceſſary, previous to the dyeing of cotton thread, to cleanſe it from that unctuous matter by which the dye is prevented from penetrating its pores. For this purpoſe they make uſe of ſour water; which is prepared by throwing ſome handfuls of bran into hot water, and letting it ſtand 24 hours, or till the water becomes ſour, when it is fit for uſe. Theſe ſour waters, however, cleanſe the cotton but very imperfectly, carrying off only the ſuperficial part of the unctuous matter, which river water would do as well. The lixiviums of aſhes are more effectual; and therefore all fixed alkalies, particularly kelp, or even the aſhes of new wood, are, for the reaſon I have already given, generally preferred for this operation. The ſalts are extracted in the ſame manner as by the bleachers; and the cotton is then ſteeped in theſe lixiviums, which, like the ſilk, is incloſed in a clean linen pocket or ſack, to prevent the ſkeins from tangling: it ſhould boil for a couple of hours: when perfectly cleanſed, the pockets ſink to the bottom of the liquor, becauſe the impeding matter being removed, the water penetrates the pores. The pocket is then taken out of the copper, the ſkeins ſeparated from each other, and waſhed at the river. They are afterwards wrung on the peg, and again rinſed till the water comes off clear. The ſkeins are then ſpread on the perches to dry.

“ To dye cotton red requires three preparations, viz. cleanſing, galling, and aluming. The operation of cleanſing as above.

“ With regard to the galling, any kind of galls may be uſed in caſe of neceſſity; or even tan may be ſubſtituted; but that requiring more, it would not anſwer the purpoſe ſo well. The black Aleppo galls, becauſe leſs ſuffices, are preferable to the white galls, which though cheaper make the expence come nearly equal. The Aleppo galls are, however, liable to dull the colour, which though eaſily revived, the white not producing this inconvenience, are generally preferred by moſt dyers. It requires nearly five quarts of liquor to drench one pound of cotton; ſo that for 20 pounds, five pounds of pounded galls are boiled in about 120 quarts of water; it ſhould boil for two hours, or till by preſſing it between the fingers it breaks eaſily.

This liquor is drawn off clear, and poured into a tub, into which, when cold, or even whilſt warm, the cotton, which was before divided into hanks of about eight ounces each, and tied with a thread to prevent them from tangling, is dipped. Suppoſe, for example, that having about 40 of theſe hanks, and 100 quarts of the gall liquor, a part of it neceſſarily evaporating in the boiling, five quarts of this liquor is taken out of the tub and put into a trough, into which you dip two ſkeins at once, carefully working them till they are ſoaked. They are then taken out and laid in an empty tub, pouring over them the remainder of the liquor in which they had been ſoaked: five quarts more are then taken out of the tub containing the gall water, poured into the trough, and two more hanks dipped into it, and ſo on ſucceſſively till the whole is galled. The gall liquor ſhould be ſtirred in the tub every time you take out, that the whole of the cotton may be galled equally, which it would not be were the grounds to ſettle at the bottom. This operation finiſhed; if any of the liquor remains, it is poured on the galled cotton, being orderly ranged in the tub; where, after remaining 24 hours, it is taken out ſkein by ſkein, gently wrung, and then put to dry.

"The aluming for the cotton conſiſts of about four ounces of Roman alum for every pound of the ſubſtance. Having pounded the proper quantity of alum, it is diſſolved over the fire in a copper containing a ſufficient quantity of water, taking care not to let it boil, otherwiſe it would loſe its ſtrength. The liquor is immediately poured into a tub or trough of cold water, proportioned to the quantity of the cotton, ſo as that the whole of the liquor may be as that of the galling, 100 quarts for every 20 pounds of cotton. It is the cuſtom to add to this alum liquor a ſolution partly compoſed of arſenic and white tartar, with one part of the lixivium of kelp. The firſt ſolution conſiſts of one grain of arſenic and two grains of white tartar, in two or three quarts of water. When the water in the copper boils, the arſenic and tartar, well pounded, is put into it, and kept boiling till the liquor is reduced to about half. When cold, it is ſtrained and put into bottles or veſſels, which ſhould be ſtopped and kept for uſe.

"The kelp lixivium is made with about half a pound to a quart of water. You will know if this lixivium be ſufficiently ſtrong, when by putting an egg into it the point only appears on the ſurface.

"You then add to the alum liquor for this ſuppoſed 20 pounds of cotton 20 quarts of the ſolution, and three quarts of the ſaid lixivium, obſerving nevertheleſs that the whole of the water uſed in mixing the alum and other ſubſtances be always in the proportion of five quarts of liquor to every pound of cotton. The 20 pounds of cotton are then plunged into this aſtringent pound by pound, in the ſame manner and with the ſame precaution as in galling; it is afterwards wrung, but without being too much ſqueezed, and then ſlowly dried.

"Some dyers never uſe the ſolution of tartar and arſenic with the alum, rationally ſuppoſing that theſe ſubſtances, as they ruſt and yellow the red colours, would be prejudicial to the dye: the red furniſhed by madder, being already too much inclined to this ſhade, requires rather to be ſaddened; and for this reaſon partly the kelp lixivium is added to the aluming. Several, therefore, uſe ſix quarts of this lixivium inſtead of three; and theſe ſix quarts containing the ſalts of about three pounds of kelp, which by ſuppoſing the kelp aſhes to contain a quarter of its weight of ſalt, is in proportion of half an ounce to every quarter of a pound of alum.

"Inſtead of the ſolution of tartar and arſenic, others make uſe of a ſolution of ſugar of lead, prepared ſeparate. It ſhould be obſerved in this particular, that when the ſugar of lead is diſſolved in common water, it becomes turbid and whitiſh, becauſe plain water not diſſolving this perfectly, a kind of partial ſeparation of the calx of lead takes place; but by mixing a ſufficient quantity of diſtilled vinegar with the water, the calx entirely diſappears and the ſolution is complete.

"When the cotton is taken out of the aſtringent, it is lightly wrung on the peg, and dried. The more ſlowly it dries, and the longer before it is maddered, the brighter the colour. Twenty pounds of cotton are generally dyed at the ſame time; but it were ſtill more advantageous to dye only 10, becauſe when there are two many hanks to work in the copper, it is very difficult to dye them equally, the hanks firſt immerſed having time to take a great deal of colour before the laſt are put in; for as the firſt cannot be returned upſide down till after the laſt are plunged, it is morally impoſſible that the dye ſhould be even.

"The copper in which this ten pounds of cotton are dyed ſhould contain about 240 quarts of water,—that is, 20 quarts of water for every pound of cotton; its ſhape ſhould be an oblong ſquare, and about two feet deep. It ſhould alſo be wider at top than at bottom; the difference, however, ſhould not be too great, becauſe in that caſe the hanks laid ſlanting on the ſides would be liable to ſpot. As ſeveral dyers have erred for want of knowing how much water the copper ſhould contain reſpecting its dimenſions, and as the greater part of the braſiers are likewiſe ignorant in this particular, it may not be amiſs, in this place, to add a ſhort and eaſy method of finding the contents of a veſſel.

59. Ready method of finding the contents of a veſſel.

"In the firſt place, ſuppoſe the veſſel round or cylindrical, you begin by meaſuring the diameter; you then ſeek the circumference, afterwards the ſurface; and at laſt, by multiplying the ſurface by the perpendicular height, the product is the cube ſought for, and determines the contents of the veſſel.

"For example, a copper 22 inches deep by 30 diameter; to find the ſurface, take the proportion of the diameter to the circumference, which is as 7 to 22: ſtate as in the Rule-of-Three, the firſt number 7, the ſecond 22, and the third 30; the fourth number will be the circumference. This fourth number is found by multiplying the two middle numbers, 22 and 30, by each other, and dividing the product 660 by 7, the firſt number; the quotient 94 is the circumference ſought for. If a ſquare or oblong veſſel, as in the preſent caſe, you have the circumference by adding the length of the four ſides.

"Multiply afterwards the half of the circumference by the radius, that is 47 by 15, the product 705 is the number of ſquare inches, and conſequently the ſurface of your veſſel.

"At laſt multiply 705 by 22, which is the perpendicular height, the product 15510 is the number of cubic inches your veſſel contains. If it is larger at top than at bottom, it is neceſſary, in order to determine the circumference, to take a middle number between the breadth of the top and the breadth of the bottom, as if the copper be 33 inches at the top and at bottom 27, the middle number and real diameter is 30.

"Having multiplied the ſurface by the perpendicular height, you muſt reduce the inches to feet. Now the ſquare foot being equal to 144 ſquare inches, and the cubic foot to 1728 cubic inches; you muſt therefore in this example divide 15510 by 1728, the quotient $9\frac{1}{11}$ will be about the number of cubic feet in the copper; and as a cubic foot contains 35 quarts, conſequently the copper contains 318 quarts Paris meaſure. (The Paris pint is our quart.) To madder 10 pounds of cotton, a copper containing 248 quarts of water is made hot. When it is rather too hot for the hand, ſix pounds and a quarter of good Dutch grape madder is put into it, and carefully opened and diffuſed in the liquor. When it is well mixed, the cotton, which had been previouſly paſſed on the rods and ſuſpended on the edge of the cotton, is dipped into it hank by hank. When it is all dipped, the hanks on each rod are worked and ſucceſſively turned upſide down, beginning from the firſt that was put in, and ſo proceeding to the laſt; returning to the firſt, and thus continuing without intermiſſion for three quarters of an hour, always maintaining an equal degree of heat, but without boiling. The cotton is then raiſed and drawn out upon the edge of the copper, and about a pint of the kelp lixivium poured into the liquor. The rods are then paſſed through the threads by which each hank is bound, and the cotton put back into the copper and boiled for about 12 or 15 minutes, keeping it entirely immerſed during that time. It is at laſt raiſed, gently drained, wrung, waſhed at the river, and wrung a ſecond time on the peg.

"Two days afterwards the cotton is a ſecond time maddered, about eight ounces of madder to every pound; that is, five pounds of madder added to the dyeing liquor. The cotton is then worked in it in the ſame manner as in the firſt maddering, with this difference, that none of the lixivium is added, and that the liquor is made of well-water. This maddering being finiſhed, and the cotton cooled, it is waſhed, wrung, and dried.

"To brighten this red, you put into a copper or trough a quantity of warm water ſufficient to drench the cotton, pouring into it about a pint of the lixivium. In this liquor you immerſe the cotton pound by pound; leaving it in for an inſtant only, when it is taken out, wrung, and dried.

"On this operation it ought to be obſerved, that the method of dyeing in two liquors has no advantage: For, beſides that it conſumes more time and wood, the ſecond maddering cannot furniſh much dye, conſidering that the aſtringent ſalts are exhauſted by the boiling of the firſt maddering; conſequently that the cotton, when deprived of theſe ſalts, cannot take the dye. I propoſe therefore another method now purſued with ſucceſs by ſeveral dyers: it conſiſts in giving the cotton two alumings, and afterwards dyeing in one liquor only. By this means it takes the dye much better, and acquires more depth, becauſe the whole of the madder turns to advantage. With reſpect to brightening, it is a needleſs operation for red cotton deſtined for the fabrication of callico; becauſe the colour is brightened after it is woven, by dipping in warm water ſharpened with a little of the lixivium. When the cotton is taken out of this water, if waſhed at the river and ſpread on the graſs, the red brightens much better than by any other operation.

"The reds hitherto mentioned are vulgarly called *madder reds*, though thoſe I am going to deſcribe are equally obtained from a ſpecies of madder coming from the Levant. The latter, however, commonly called *lizary*, furniſhes a dye incomparably finer than that produced by the beſt Zealand madder: it is, however, the faſhion to call the red of madder the firſt dye, and the Adrianople red the ſecond. The proceſs of the latter I ſhall give in this place.

"When you have 100 pounds of cotton to dye, you put 150 pounds of Alicant ſoda, incloſed in clean linen, into a tub. This tub ſhould be full of holes at the bottom, that the liquor may run into another tub underneath. The 150 pounds of ſoda being in the upper tub, is covered with 300 quarts of river-water, meaſured by wooden pails containing each 25 quarts. The water that paſſes from the firſt tub into the ſecond is again poured over the ſoda at different times, till it has extracted all the ſalt. This lixivium may be tried with oil: if it uniformly whitens, and mixes well with the oil without any appearance of ſeparation at the ſurface, it is then ſufficiently ſaturated with the ſalt. It may be alſo tried with a freſh egg, as I have ſaid above. You again pour 300 quarts of water over the ſoda contained in the ſuperior tub, in order to extract the whole of the ſalt. Two ſimilar lixiviums are afterwards made, each with the ſame quantity of water as had been uſed for the ſoda, viz. 150 pounds of freſh wood-aſhes, and the other with 75 pounds of quicklime. Theſe three lixiviums being clarified, 100 pounds of cotton are put into a tub, and watered with each of theſe lixiviums in equal proportion. When it has perfectly imbibed theſe ſalts, it is put into a copper full of water without being wrung, and boiled for three hours: it is afterwards taken out and waſhed in running water. This operation being finiſhed, the cotton is dried in the air.

"A quantity of the above-mentioned lixiviums is then poured into a tub in equal portions, ſo as to make 400 quarts. In a part of this liquor, 25 pounds of ſheep's dung, with ſome of the inteſtine liquor, is well diluted by means of a wooden peſtle, and the whole ſtrained through a hair-ſieve. Twelve pounds and a half of good olive-oil poured into this mixture, when finiſhed, inſtantly forms a ſoapy liquor. In this the cotton ſhould be dipped hank by hank, ſtirring every time, and with the ſame precautions I have already recommended in the aluming of cottons deſtined for the madder red. The cotton having remained 12 hours in this ſoapy water, is then taken out, lightly wrung and dried. This operation is repeated three times. The liquor that runs from the cotton when wrung falling again into the trough where the cotton was laid is called *ſickiou*, and ſhould be kept for brightening.

"When the cotton has been three times dipped in this ſoapy water, and afterwards dried, it is again dipped three times in another compoſition, made in the ſame manner as the firſt, with 400 quarts of lixivium and 12½ pounds of oil, but without the ſheep's dung: the remainder of this liquor is alſo preſerved for brightening. The cotton having been dipped in this liquor three times with the ſame precautions, and left in it the above-mentioned time, it is then carefully waſhed at the river to diveſt it entirely of the oil, without which the aluming would not take effect. Having been waſhed, it ſhould be as white as if it had been bleached.

"When dry, you proceed in the aluming, which is done twice ſucceſſively; but it is needleſs to give a detail of what has been ſufficiently explained in the article upon madder red. It is enough in this place to ſay, that the galls, about a quarter of a pound to every pound of cotton, ſhould be pulverized; that ſix ounces of alum ſhould be put to the firſt aluming; for the ſecond four ounces; and at laſt, that an equal quantity of the lixivium be added to the alum-water. We muſt alſo obſerve, that it were beſt to make an interval of three or four days between each aluming; and that no other aſtringent be added, all metallic ſalts being in general injurious to the beauty of the colour.

"Some days after the laſt aluming, you proceed to dyeing in the ſame manner as above, only uſing two pounds of lizary in powder for every pound of cotton; and, before you dye, adding to the liquor about 20 pounds of liquid ſheep's blood. It ſhould be well ſtruck into the liquor, which ſhould be carefully ſkimmed.

"In order to brighten the colour, the cotton is dipped in a lixivium of freſh wood aſhes, diſſolving in it five pounds of the beſt white Marſeilles ſoap; the water ſhould be warm before the ſoap is put into it. In this mixture the 100 pounds of dyed cotton is immerſed, and worked till it becomes perfectly penetrated. Six hundred quarts of water are then put into another copper; and when warm, the cotton, without ſqueezing it out of the firſt, is put into the ſecond, and boiled for three, four, five, or ſix hours, over a very ſlow fire, but as equal as poſſible, carefully covering the liquor to keep in the vapour, that none may eſcape but what paſſes through a funnel of ſmall reeds.

"Some pieces of the cotton are taken out from time to time; and when ſufficiently revived and waſhed thoroughly, the red is perfect. The cotton may be alſo brightened in the following manner: when waſhed and dried immediately after dyeing, it ſhould be ſoaked in the ſickiou for an hour, well ſqueezed, and alſo dried. When dry, you diſſolve for every 100 pounds of cotton 5 pounds of ſoap in a quantity of water ſufficient to cover the cotton. When the water is warm, the cotton is immerſed; and having well imbibed, is put into a copper with 600 quarts of water. The whole is boiled very ſlowly during four or five hours, keeping the copper covered to prevent the ſteam from going off. This ſecond method makes the red much brighter than the fineſt Adrianople carnation.

60 Difficulty in producing a good red by this proceſs.

"The proceſs juſt deſcribed was practiſed at Darnetal, and in other manufactories of France, according to inſtructions communicated by a perſon who had ſeen this proceſs in Turkey. But whether his obſervations were inaccurate, whether he concealed a part of the myſtery, or whether the ſucceſs of the operation depended on the concurring circumſtances accompanying the various mixtures, I know not. Few, however, by cloſely obſerving this proceſs, have hitherto obtained a red either ſo permanent or ſo beautiful as the red of Adrianople, and thoſe who have ſucceeded think it but juſt to reap the advantage of their ſecret. On this ſubject, however, ſeveral not unuſeful reflections may be advanced.

61 Obſervations of M. de Apligny upon it.

"Firſt, the manner of purging the cotton indicates that this proceſs is capable of damaging conſiderably, and of rendering the cotton very brittle, owing to the ſharpneſs of the lixivium in which it is ſteeped, ſo burning in its nature as to make holes in the legs of the workmen who tread it with their feet. It is therefore more ſimple and leſs dangerous to cleanſe the cotton in ſix quarts of lixivium to every pound of ſubſtance, and containing only ſix ounces of kelp for every ſix quarts; to boil the ſkeins in it afterwards, incloſed in clean linen pockets.

"By this method the cotton would be ſufficiently cleanſed without being ſpoiled; the kelp may be even reduced to half the quantity, ſubſtituting in its place double its weight of freſh wood aſhes, which would anſwer quite as well.

"Secondly, that the failure of many dyers is owing to their not ſufficiently diveſting the cotton of the oil, which prevents both the galling and aluming from taking effect. The mixture of the lixivium and oil not being well made, or the lixivium being too weak, the oil forms with it but an imperfect combination. This oil therefore, ſeparating and ſwimming on the ſurface of the lixivium, ſticks to the cotton, which it greaſes, and by obſtructing the pores prevents the gall from penetrating. Great attention therefore ſhould be given to the lixivium, in order to extract all the ſalt of the kelp, and to uſe quicklime, which is abſolutely neceſſary to render this lixivium cauſtic; a quality without which the oil cannot poſſibly form a combination with the alkali, conſequently can make no ſoap.

"In Europe the oil of olives is ſubſtituted inſtead of the oil of ſeſamum, which is uſed in the Eaſt-Indies and in Turkey; but the nature of theſe oils makes no difference in the operation. The oil of ſeſamum differs from the oil of olives only becauſe it is thicker, conſequently nearer to the nature of animal fat or wax; but the concluſion reſulting from this difference is, that leſs of it may be required than of the oil of olives. Were the oil of ſeſamum abſolutely neceſſary, it might have been eaſily procured. The ſeſamum is a ſpecies of fox-glove that grows in the Indies; but is cultivated in Italy, and eſpecially in Sicily, where it is called *giurgulena*. The ſame kind of oil may be obtained from plants analogous; ſuch as the gratiole, the henbane, &c. but the plant whoſe ſeed reſembles it moſt is the convolvulus or lizeron.

"It is certain that the proceſs brought from Adrianople might be greatly abridged; but we muſt leave the ſecret to thoſe to whom it belongs: and I am beſides convinced, that a memoir on this ſubject will be preſented to the Academy of Sciences, and therefore will not anticipate.

"With regard to the ſheep's dung and inteſtinal liquor, it is of no uſe in fixing the colour. But we know, that theſe ſubſtances contain a large quantity of volatile alkali quite developed, which has the property of roſing the red colours. If the bones of animals owe to their tenacious gluten the faculty of retaining ſo ſtrongly the madder colour, the vivacity of this colour may be attributed, as from experience we learn, to their volatile alkali. It were abſurd to imagine that the Europeans only had diſcovered this phenomenon; as it may be rationally ſuppoſed, that the Indians, having perceived it by accident, ſought to imitate what chance had brought to their knowledge. It is certain, that in the red dye of the Maroquins, the proceſs of which was brought from the Levant, they prepared the goat ſkins for dyeing with dog's excrement, having found it effective in exalting the dye of the lac.

"In the dyeing of cotton thread, it is common to mix the ſheep's dung with a lixivium of fixed alkali; by which the volatile principle of the dung is retained, and conſequently putrefaction prevented. By dipping the cotton ſeveral times in this ſoapy liquor, it is impregnated with the predominating alkaline principle; and we know by experience, that ſubſtances once impregnated with volatile alkali, for example, chemical veſſels uſed in extracting it for a long time, retain a ſmell very like the ſmell of muſk, even after having been well ſcrubbed with ſand, aſhes, ſoap, &c. Every time the cotton is dried when taken out of this liquor, the evaporation of the aqueous particles (the alkaline principles being changed into earth) produces a ſtronger adheſion in the pores of the cotton. From the union of this earth with a portion of the oil employed, a maſtic is the reſult, which is afterwards completed by the alum; and this, in a word, is the theory of the fixity of this colour.

62
Of the dyeing of linen.

"Linen thread may be dyed in the ſame manner; only that, previous to its being purged like the cotton thread, it is uſual to boil it in water, adding for every pound of thread a quarter of a pound of chopped ſorrel. Oil of vitriol is, however, more convenient and better than ſorrel. But I refer my reader to what I have already ſaid upon the article of thread; obſerving only, that by this proceſs the linen thread always takes leſs dye than the cotton, owing to the difference of their pores.

63
Method of dyeing crimſon in the Eaſtern countries.

The following proceſſes were taken from the manuſcripts of M. Hellot. "According to the letters of M. Grange, correſpondent of the Royal Society, who died at Schiras in Perſia, June 1737. the dyers of the city of Damas dyed their crimſon colour, ſo beautiful and ſo much eſteemed in the eaſt, in the following manner: Take ten *rottes* (a rotte weighs five pounds) of ſilk in ſkeins; waſh it well in warm water; then let it ſoak in a ſufficient quantity of hot water during half an hour; ſqueeze out the water; dip it afterwards, but once only, in a hot lixivium, made with a ſufficient quantity of water, half a *rotte* of kelp aſhes for every rotte of ſilk, which is immediately drained on rods, taking care not to leave the ſilk longer in the lixivium than is neceſſary for its being well ſoaked, leſt the alkali ſhould corrode it.

"Whilſt the ſilk drains, they prepare another liquor cold, with ten ounces of the pulp of yellow melon, very ripe, which is uniformly diffuſed in a ſufficient quantity of water. They ſteep in this liquor the ten *rottes* of ſilk for twenty-four hours; they increaſe or diminiſh the quantity of the above drugs in proportion to the quantity of the ſilk to be dyed. The ſilk having remained one day in this melon liquor, is ſeveral times waſhed in freſh water till it becomes perfectly clean; they then hang it to dry. Mean while the workmen fill a large pan of water, adding a half *rotte* of alum powdered for every *rotte* of ſilk. The pan is then ſuſpended over a hot furnace, and the liquor boiled during twenty minutes; after which the fire is taken from the furnace. The ſilk is then dipped in this alum ſolution, moderately hot, and again taken out as ſoon as it is perfectly wet. They then put it into another pan, pouring over it the alum ſolution, in which it remains four or five hours, but no longer. It is then taken out and ſeveral times waſhed in freſh water.

"Whilſt the ſilk is waſhing, a workman fills a large pan with water, adding an ounce of *baiſonge* (a fungus), finely powdered, for every rotte of ſilk; when this new decoction has boiled for half an hour, they add ten ounces of *oudez* (cochineal), very finely powdered, for every rotte of ſilk; that is, ſix pounds four ounces of cochineal for ten rottes of ſilk. As ſoon as this cochineal is added, the fire is taken from the furnace. The liquor is then gently ſtirred round with a ſtick; and when the mixture is perfectly made, they pour gently and by inclination a little freſh water into the middle of the pan. The water thus added not only cools the dye, but makes it much more lively. They then immediately dip the ſilk four or five times, wringing after every dip. This tincture is afterwards boiled again for about a quarter of an hour, and the fire is then taken from the furnace as before. When the liquor is a little cool they dip the ſilk, ſtill obſerving to wring after every dip. This done, they put the ſilk into an empty kettle, pouring over it the remainder of the dye, in which it is left to ſoak for twenty-four hours. It is then well waſhed in clean water, dried in the ſhade, and when very dry wove into ſtuffs. This crimſon is much ſuperior to all the French and Italian crimſons; becauſe the ſilk was never boiled in the dye.

"The dyers of Damas and Diarbequir ſay, that they could not accompliſh this dye without the pulp of the yellow melon in the preparation, or without the *baiſonge* uſed with the cochineal in the dye. According to M. Grainge, we have this melon in France; but he doubts concerning the *baiſonge*, which is a ſpecies of fungus growing on trees in ſome parts of Perſia, from whence it is brought to Damas, and might alſo be ſent into France by the way of Aleppo, were we deſirous of imitating this excellence in the crimſon dye.

"To avoid miſtakes in the quantity of the different ingredients employed in this proceſs, it may be neceſſary to repeat, that a rotte of ſilk weighs five French pounds, and that the ten rottes of ſilk, produced as an example in this memoir, ſhould alſo ſerve as a ſtandard with regard to the quantities of the other ingredients.

"As to the water neceſſary for the preparation of the ſilk with the kelp, melon, and the alum for the dye, it requires no more than a ſufficient quantity for wetting the ſilk, namely, about a finger's breadth over it, differing from the tincture, which as the ſkeins are dipped in this liquor at leaſt ten or a dozen times, ſhould be fuller in the kettle.

"The kali uſed in the preparation of the ſilk is nothing more than the aſhes of a plant called by the

Arabs kailou. Theſe are preferable to the aſhes made from the *rouquet*, or thoſe made in Egypt.

"The frames uſed for theſe ſilks are ſimilar to the frames uſed at Lyons.

64 Genoeſe method of dyeing crimſon.

"At Genoa the ſilks deſigned for crimſon are boiled in a much leſs quantity of ſoap than thoſe intended for any other colour, 18 or 20 pounds ſerving for a hundred pounds of ſilk in the crimſon dye; for any other colour, the Genoeſe uſe 40 or 50.

"When the ſilk is boiled, it is dipped in the alum liquor; and to a quantity of raw ſilk, weighing 72 pounds, they put from 16 to 18 pounds of roch alum, finely powdered, into a copper full of cold water. When the alum is perfectly diſſolved, the ſilk is put to ſoak in it for near four hours: it may remain longer without any inconvenience, ſilk intended for crimſon requiring more alum than for any other colour. When taken out of the alum liquor, it is ſhook and dreſſed on the pegs, but without wringing. One of the dyers being queſtioned why the ſilk was not wrung when taken out of the liquor? anſwered, that it would purge it too much from an impregnation ſo abſolutely neceſſary for its taking the crimſon dye.

"Of the 72 pounds of ſilk already mentioned, 32 pounds is *organzine*, and the remaining woof. At Genoa it is the cuſtom to allow two ounces of cochineal to twelve of *organzine*, if deſigned for the warp of damaſk furniture, and for the ſame ſilk an ounce and three quarters of cochineal for 12 ounces of the woof, ſuppoſing it neceſſary to the beauty of the ſilk that the warp ſhould be fuller than the woof; and to bring the colour of the damaſk to ſtill more perfection, they add to the *organzine* a quarter of an ounce of cochineal, that is, inſtead of two ounces they add two ounces and a quarter, adding no more to the woof than one ounce and three quarters.

"As the above 32 pounds of *organzine* ſhould be of the fineſt colour, they allow two ounces and a quarter of cochineal to every pound of ſilk; ſo that upon the whole they uſe 142 ounces of cochineal, or 11 pounds 10 ounces, Genoa weight; namely, 32 pounds of *organzine* to two ounces and a quarter of cochineal, making 72 ounces; 40 pounds of woof to one ounce and three quarters, making 70 ounces. Total, 142 ounces.

"In order to dye this 72 pounds of ſilk, alumed as above, they make uſe of an oval copper containing when full 200 quarts of water; they fill this copper two-thirds full of clean fountain water, adding afterwards the following drugs pounded and ſifted. Two ounces of tartar, two ounces of *ſaffranum*, and two pounds and a half of the Levant galls.

"They wait till the drugs have boiled two minutes in this liquor; after which they add the 11 pounds 10 ounces of cochineal finely powdered and ſifted; and whilſt one of the workmen by degrees makes it ſink to the bottom, another keeps violently ſtirring the liquor with a ſtick to promote the ſolution.

"This done, they fill the veſſel with clean water to about a foot of the edge, immediately afterwards dipping the 32 pounds of *organzine*, divided on 14 rods. They let it remain till the veſſel which they fill with clean water, and under which they put a large fire, is ready to boil; they then, to make the ſilk take the colour more evenly, raiſe the rods without ceaſing, one after another, that each may alternately reach the bottom of the copper, which being but two-thirds full, the upper part of the ſilk would elſe remain out of the liquor, the rods being ſupported on the edge of the copper.

"When the liquor was ready to boil, the forty pounds of woof, divided on 18 rods, were dipped; they ſtill continuing to raiſe the rods, one after another, for half an hour, both the organzine and the woof, that each may alternately reach the bottom; ſo that when the workman came to the laſt he returned to the firſt, and ſo on ſucceſſively.

"After the firſt half hour, they ſtopped for a quarter of an hour between every operation, the workmen ſtill raiſing the rods from the firſt to the laſt, five or ſix times repeated in the ſpace of an hour and an half; all the time keeping a good fire under the copper. The *organzine* was then ſteeped in this liquor two hours and a quarter, and the woof only two hours. The fire was then taken from under the copper; and the workman taking out one dip of the *organzine* and another of the woof, he wrung and dried them as much as he could to ſee if the colour was what he wiſhed; if not ſufficiently deep for the purpoſe, he let them both remain in the liquor ſomething leſs than half an hour whilſt the liquor was growing cold. He then took out all the ſilk, wrung it on the peg, then waſhed it ſeveral times in clean water, changing the water every time. This done he wrung it again on the pegs, and ſo finiſhed the operation.

"It muſt be obſerved with regard to the *organzine* and woof, that though dyed in the ſame liquor, they were not however of the ſame ſhade at the concluſion of the operation; the organzine was deeper, having been a quarter of an hour longer in the cochineal liquor, during which time it was impregnated with the more ſubtle colouring particles of the cochineal.

"At Genoa it is not the cuſtom to waſh the ſilk out of the cochineal with ſoap water; on the contrary, they are perſuaded that this practice dulls the brightneſs of the colour, and that the water, both for the cochineal liquor and for waſhing afterwards, ſhould be the fineſt ſpring-water: for they remark, that the crimſon dyed in ſummer with ciſtern water, is by no means ſo bright as the crimſons dyed at other ſeaſons when the fountains are full.

"According to the dyers of Genoa, there is a kind of cochineal which though apparently beautiful, is not ſo in effect; that in uſing this cochineal it is neceſſary to alum the ſilk as much as poſſible, and to add to it more tartar than before mentioned. It is, however, impoſſible to give any certain rules concerning this matter; the dyer himſelf will judge of the quality of the cochineal fit for uſe. He ſhould however uſe the beſt; for were it even a fact that the inferior kind, with the aſſiſtance of a greater quantity of alum and tartar, gives a colour equal to the beſt, the ſilk thus weakened by alum would neceſſarily be always leſs perfect. The Genoeſe manufacturers are ſo well convinced of this, that they themſelves furniſh their dyers with cochineal in proportion to the ſilk given to be dyed."

65 Analyſis of the ſediment remaining after dyeing ſcarlet or crimſon.

After the operations of dying ſcarlet and crimſon already mentioned, there always remains a brown ſediment in the bottom of the liquor, which is thrown out as uſeleſs. This, on being examined by M. Hellot, was found to be a precipitated calx of tin, as he has aſcertained by reviving the metal from it, though not without great trouble, ſo that there can be no advantage in repeating his experiments. The remainder of this ſediment was compoſed of the dregs of the cream of tartar united with the groſs animal particles of the cochineal. Theſe laſt being waſhed over with water, and thus ſeparated from the earthy and metallic parts, were dried ſeparately, and afterwards bruiſed with an equal weight of cryſtals of tartar; after which they were ground to an impalpable powder, and boiled with a little alum. Thus they communicated a fine crimſon colour to a pattern of white cloth; from which our author is of opinion, that the cuſtom of reducing cochineal to powder and only ſifting it, does not give an opportunity of ſufficiently extracting the colour from this valuable material; he therefore gives the following receipt for doing ſo in a more perfect manner. "To an ounce of cochineal powdered and ſifted as uſual, he adds a fourth part of its weight of very white, clean, and dry cream of tartar. Theſe being ground together on a marble ſtone to an impalpable powder, are uſed both in the preparation and in the dye, omitting the ſmall quantity of cryſtals of tartar formerly directed for the preparation." The quantity here directed to be put to the cochineal, he thinks, evidently renders the colour more fixed.

66 How to extract all the colour from cochineal.

For madder red the preparation is pretty much the ſame as for kermes, and is always made with alum and tartar. Dyers are not agreed with regard to the proportions. M. Hellot puts five ounces of alum and one of red tartar to every pound of worſted; adding likewiſe about a twelfth part of ſour water, and boiling the wool in this ſolution for two hours. Worſted is to be kept for ſeven or eight days moiſt with this ſolution; but cloth is finiſhed in four days. A freſh liquor is prepared for dyeing this wool; and when the water is ſufficiently hot to bear the hand in it, you moſt throw in, for every pound of wool, half a pound of the fineſt madder, carefully ſtirring and mixing it well in the copper before you put in the wool, which is to be kept in for an hour; but without letting it boil, as that would tarniſh the colour. Nevertheleſs, for the dyer's ſecurity, it may boil for three or four minutes at the end of the operation; but the more that madder is boiled, the worſe is the colour it yields.

67 Of dyeing yellow.

The third primitive colour ſpoken of among dyers is that of yellow: and for this M. Hellot obſerves, that there are ten different ingredients fit for the purpoſe, though only five of them yield a good and permanent dye. Theſe are weld, ſavory, green-wood, yellow-wood, and fenugreek.

"Weld or wold generally yields the trueſt yellow, and is therefore preferred to all the others. Savory and green-wood, being naturally greeniſh, are the beſt for the preparation of wool to be dyed green; the two others yield different ſhades of yellow.

"The ſhades of yellow, beſt known in the art of dyeing, are ſtraw colour, pale yellow, lemon colour, and full yellow. The common orange colours are not ſimple, and therefore we ſhall not ſpeak of them at preſent.

68 Worſted or woollen ſtuffs.

"For dyeing worſted and ſtuffs yellow, you make uſe of the uſual preparation, viz. of tartar and alum. You allow four ounces of alum to every pound of wool, or 25 pounds to every 100. With regard to the tartar, one ounce to every pound is ſufficient for yellow, though it requires two for red. The method of boiling is ſimilar to the preceding. For the welding, that is to ſay for yellowing, when the wood or ſtuff has boiled, you make a freſh liquor, allowing five or ſix pounds of weld to every pound of ſtuff; ſome incloſe the weld in a clean woollen bag to prevent it from mixing in the ſtuff; and to keep the bag down in the copper they put on it a croſs of heavy wood. Others boil it in the liquor till it has communicated all its colour, and till it falls to the bottom; the ſtuff is then ſuſpended in the net, which falls into the liquor; but others, when it has boiled, take out the weld with a rake, and throw it away. They ſometimes mix yellow wood with this weld; and ſome dyers mix any of the other ingredients before ſpecified, according to the ſhade required. By varying the proportions of the ſalts for the preparation, the quantity of the colouring ingredients, and the time of boiling, it is poſſible to produce an infinite variety of ſhades.

"For regular ſhades of light yellows you proceed as for all other regular ſhades, only that light yellows require a weaker preparation. For example, 12 pounds and a half of alum to 100 pounds of wool is ſufficient. The tartar ſhould alſo be diminiſhed, becauſe the wool is always waſted a little by the preparation, and that when you require only light ſhades they may be as eaſily obtained by a weaker preparation; thus you ſave alſo in the expence of the ſalts. But theſe light ſhades do not ſo well ſtand the teſt as the darker ſhades, which are dyed with the full proportion of tartar. Some dyers ſuppoſe that by letting their wool and ſtuff remain longer in the dye, they remedy this evil; becauſe they imbibe the colour more ſlowly in proportion to the weakneſs of the decoction: if you put wool into the dye, differently prepared, it will in the ſame time imbibe different ſhades. Theſe weaker preparations are called *half preparations* or *quarter preparations*, and require great attention, eſpecially for light ſhades of wool when dyed in the fleece for the manufactory of cloth and mixt ſtuffs, becauſe the wool is harder and more difficult to ſpin in proportion to the quantity of alum in the preparation; the ſtuff is conſequently leſs fine. This obſervation is not, however, of much importance with regard to worſteds for tapeſtry, neither with reſpect to ſtuffs; but it is not much amiſs were it only to ſhow that the quantities of the ingredients uſed in the preparation are not ſo very exact; but that they may be varied without any riſk, whether to give to the ſame ſhades to wool prepared in different preparations, or whether to make but one preparation, if more convenient for different ſhades.

"In order to dye with yellow wood, it ſhould be ſplit, or rather ſhaved with a joiner's plane: by this means it is more divided, conſequently yields better, ſo that a ſmaller quantity will do. Prepare it as you will, it ſhould always be tied up in a bag, to prevent it from mixing with the wool, and from tearing the ſtuff. The ſavory and green-wood, when uſed inſtead of weld, in order to vary the ſhade, ſhould be incloſed in the ſame manner.

“To the above mentioned ingredients for dyeing yellow we may here add the root of dock, the bark of aſh, eſpecially the ſecond bark; the leaves of the almond tree, peach, and pear tree; in ſhort, all aſtringent leaves, barks, and woods. Theſe will produce good yellows, more or leſs fine according to the time they have boiled, and in proportion as the alum or tartar predominates in the preparation. A larger quantity of alum makes it almoſt as fine as the yellow of weld; if the tartar prevails, the yellow has more of the orange; but if theſe roots, barks, or leaves, boil too much, the yellow terminates in ſhades of fawn colour.

“Though ſeveral dyers are accuſtomed for the good dye to uſe turmeric, a root imported from the Eaſt Indies, and which produces an orange yellow, it is however blameable; becauſe the colour very ſoon fades, at leaſt if not fixed with marine ſalt, as practiſed by ſome dyers who carefully conceal this art. Thoſe who uſe it for common ſcarlet, in order to ſave cochineal, and to give a lively orange red, are alſo reprehenſible; for ſcarlets dyed in this manner very ſoon loſe their bright orange caſt, which darkens by the air. We are, however, obliged in ſome degree to tolerate the deception; for this flaming colour being ſo much in vogue, it were impoſſible to produce it otherwiſe but by increaſing the quantity of compoſition, the ſuperabundant acid of which conſiderably injures the cloth.”

69
To dye ſilk of a yellow colour.

For dyeing ſilk of this colour it ſhould have about 20 pounds of ſoap for every 100 of ſtuff; and after boiling with this ingredient, it ſhould be waſhed, alumed, and waſhed again (which is called *refreſhing*), when it is to be put upon the rods in hanks of about ſeven or eight ounces, and then dipped and returned in the yellow liquor. The fineſt yellow for ſilk is weld; and the proceſs, as delivered by M. Macquer, is as follows:

“A copper is prepared with about two pounds of weld to every pound of ſilk; and that all the weld may be well ſoaked, it is loaded with a large piece of wood. When it has boiled a good quarter of an hour, the bunches are puſhed to the far end of the copper, or rather, if you pleaſe, taken out; and by means of a bucket or ladle all the liquor may be taken out of the copper, and ſtrained into a copper or wooden trough; that is, by putting a ſieve or linen cloth acroſs a trough; by which means the liquor is cleanſed from all the grain and little ſtraws left by the weld in boiling. The liquor thus ſtrained is left to cool till you can bear your hand in it: the ſilk is then dipped and returned till the colour becomes uniform. If this boiling does not make ſufficient to fill the trough, it muſt be ſupplied with water, which ſhould be added before the liqour is cold, that the degree of heat already mentioned may be preſerved. In general, all dying veſſels ſhould be full, that the ſilk when dipped may be only two inches from the edge.

“During this operation the weld is a ſecond time boiled in freſh water; and when it has boiled, the ſilk ſhould be raiſed at one end of the trough, either upon a kind of barrow, or upon the edge of the trough. Half the liquor is then thrown away and repleniſhed by adding of the ſecond boiling as much as was taken from the firſt, obſerving to rake and mix the liquor well: ſuch is generally the method when any new addition is made; at leaſt if the contrary is not particularly ſpecified. This new liquor may be uſed rather hotter than the firſt; it ſhould nevertheleſs be always of a moderate heat, becauſe otherwiſe it would deſtroy a part of the colour which the ſilk had already taken, probably owing to the ſilk being deprived of part of the alum by the heat of the liquor. The ſilk is returned in this freſh liquor as at firſt; mean while you prepare a ſolution of pearl-aſh in proportion of about one pound to every twenty pounds of ſilk.

“For this purpoſe the pearl-aſh is put into a copper, and the ſecond liquor, quite boiling, poured on it, ſtirring in order to aſſiſt the diſſolving of the ſalt. This ſmall liquor is left to ſubſide, and the ſilk is a ſecond time raiſed on the barrow or trough, throwing into the liquor about two or three ladles of the cleareſt of the ſolution. The liquor is then well raked, the ſilk replunged, and again returned. This alkali developes and brightens the yellow of the weld. After ſeven or eight returns, one hank is wrung to try if the colour be full enough and ſufficiently bright; if deficient, a little more of the ſolution of the aſhes muſt be added, and the remainder of the ſilk done in the ſame manner till it has taken the ſhade required. The lixivium, ſeparately prepared, may be added, if you will, at the ſame time with the ſecond boiling of the weld-liquor; care ſhould be taken however that the liquor be not too hot. This operation is only for yellows, nor would the liquor do for greens.

“For yellow ſtill fuller, approaching to jonquil, when the pearl-aſh is added, it may be alſo neceſſary to add ſome rocou, in proportion to the ſhade required.

“For the light ſhades, ſuch as pale lemon or Canary-bird, they ſhould be boiled in the ſame manner as for blues, theſe ſhades being much more beautiful and tranſparent when dipped in a clear ground. To do this, when the weld is ready to boil, ſome of the liquor ſhould be taken out and mixed with a little clean water and a little of the liquor of the vat if boiled without azure. The ſilk is then dipped as uſual; and if deficient in ſhade, the weld liquor muſt be re-added, and the dipping repeated, if neceſſary, to complete the ſhade required.

“For deeper lemon colours the weld ſhould boil as for yellows, adding only a certain quantity with clean water, according to the fulneſs of the ſhade required: ſome of the liquor of the vat may alſo be added if neceſſary; but theſe dark lemon colours may be boiled in the common way as for yellows. It muſt be obſerved, however, that the blue of the vat is never added to theſe colours but when it is intended to give them a greeniſh caſt.

“Theſe very pale yellow ſhades are rather difficult, as they are very frequently liable to be affected by the air, and to deepen too much while drying. This happens when alumed in the common way, which is too much; but this inconvenience may be avoided, if inſtead

ſtead of aluming as for other yellows, a ſeparate liquor is prepared, or even without any particular preparation, only a little alum put into the liquor of the weld.

"In manufactories where they cannot eaſily procure weld, they make uſe of the grains of Avignon, and preciſely in the ſame manner; but it gives a leſs permanent colour."

70 To dye cotton yellow. Cotton to be dyed of a yellow colour ſhould be firſt well cleanſed in a lixivium of freſh wood aſhes, and afterwards well waſhed and dried. Another liquor is then prepared by diſſolving in the water, when ready to boil, about a quarter the weight of the ſubſtance to be dyed of Roman alum. The ſkeins are plunged into this alum liquor, returning them on the rods for ſome minutes. When equally penetrated throughout, the threads by which the ſkeins are tied being paſſed on the rods, the hanks are laid on the trough containing the alum liquor. The copper or trough is then covered, it being ſufficient to keep the liquor hot without boiling. The cotton, having been thus infuſed for 24 hours, is then dried, but without waſhing. We muſt obſerve, that the longer it remains dry, the better it takes the colour, and that the waſhing may be even diſpenſed with previous to the yellow dye.

A ſtrong weld liquor is afterwards prepared, adding for every pound of the ſubſtance to be dyed a pound and a quarter of weld. The cotton or thread, having been previouſly alumed, is then immerſed; the boiling checked with cold water, and the ſubſtance worked till it has taken the ſhade required.

The whole when dyed is plunged into a very hot liquor, but not boiling, made of blue vitriol, a quarter of a pound for every pound of the ſubſtance. When it has remained for about an hour and an half, the whole, without waſhing, is thrown into another liquor compoſed of about a quarter of a pound of white ſoap for every pound of the ſubſtance. Having been well worked and the threads opened, it ſhould boil for three hours or more if you think proper. The ſoap might be diminiſhed to half the quantity, but the full proportion does better. This operation finiſhed, the whole is well waſhed and dried.

If you deſire a dark or jonquil yellow, neither the linen nor cotton ſhould be alumed; but for every pound of thread ſhould be added two pounds and a half of weld. When it has been dipped and well worked in this liquor till it has taken the colour equally, it is raiſed above the liquor, and half a pint of the kelp lixivium poured into it, made as directed in the article upon *red*. The thread is then returned upon the rods, dipped in this liquor; where having remained for a full quarter of an hour, it is taken out, wrung, and dried.

The lemon yellow is done after the ſame manner, only that for every pound of thread you put but one pound of weld, diminiſhing the verdigris in proportion, or even omitting it entirely by ſubſtituting in its place the alum liquor. By this means the yellow ſhade may be varied *ad infinitum*, and without any difficulty; in brightening and fixing the colour, however, the above method muſt be always obſerved.

Cotton-velvet is dyed with the root of a plant called *curcum* or *terra merita*, a ſpecies of ruſh which comes from the Eaſt Indies. It gives a beautiful yellow colour; but if dyed in the common manner, has but little ſolidity. This colour, according to M. de Apligny, may be fixed upon cotton or linen thread by dipping them in a ſolution of ſulphur of antimony in the kelp lixivium already mentioned. When treated in this manner, it is very beautiful as well as permanent.

71 Of fawn or root colour. The fourth primitive colour ſo called among the dyers, is that which bears the appellation of *fawn* or *root* colour. It is however a kind of brown, and has the name of *root-colour* from being an ingredient in a great number of others. The proceſs for dyeing it is different from thoſe lately deſcribed; the wool requiring no other preparation than that of being ſoaked in water, as already directed for blue. The materials for dyeing it are the green ſhell of the walnut, the root of the walnut tree, the bark of the alder, ſantal, ſumach, roudoul or fovic, and ſoot.

The green ſhells of the walnut, collected when the nuts are perfectly ripe, and put into tubs or caſks, and afterwards filled with water, are in this manner preſerved till the year following. The ſhells are alſo uſed before the nuts are ripe; but theſe ſhould be ſaved apart, in order to be firſt uſed; becauſe, as the ſoft ſhell which adheres putrifies, it will keep but for two months only.

The ſantal or ſaunders is a hard wood imported from the Indies, generally ground into a very fine powder, and preſerved in bags; becauſe it is ſuppoſed to ferment, by which it is thought to be greatly improved; but our author has never obſerved any difference. This ground wood is generally uſed with one third of cariatour wood; by which, in the opinion of thoſe who prepare it for ſale, it is much improved. It is however nothing like ſo good as the walnut ſhells; becauſe, if uſed in too large a quantity, it ſtiffens conſiderably, and thereby injures the wool; hence it were beſt not to uſe it, either for wool or fine ſtuffs, except in the ſlighter ſhades, where it would not have ſo bad effect. It is generally mixed with galls, alder bark, and ſumach, as by this means only you can obtain its colour when not mixed with the cariatour. It yields but very little with the preparation of alum and tartar, eſpecially if it be not chipped; but notwithſtanding theſe defects, it is uſed on account of the ſolidity of its colour, which is naturally a yellow red brown. The air makes it deeper, and ſoap lighter. It loſes but little by a trial of alum, and ſtill leſs by tartar.

Of all the ingredients for dyeing fawn colours the walnut rind is the beſt. Its ſhades are finer, its colour ſolid; and by making the wool flexible, renders it leſs difficult to work. It is prepared in the following manner. You fill a cauldron half full of water, and when it grows warm, you add rinds in proportion to the quantity of ſtuffs to be dyed and to the colour required. It is then boiled; and when it is boiled for a quarter of an hour, the ſtuffs, having been previouſly moiſtened with warm water, are dipped; they are then turned and well ſtirred, till they have imbibed the colour deſired. If for worſteds, requiring an exact aſſortment of ſhades, you put leſs walnut rinds, and begin with the lighteſt ſhades. You put more walnut rinds in proportion as the colour is exhauſted, and then dip the darkeſt ſhades. With regard to ſtuffs, you ge-

generally begin with the deepeſt, and as the colour of the dye diminiſhes, you dip the lighteſt. They are aired as uſual, dried, and dreſſed.

The root of the walnut tree is, next to the huſk, the beſt dye for fawn colour: it alſo gives a very great number of ſhades, nearly reſembling thoſe of the huſks; hence they may be ſubſtituted for each other, but the root requires a different proceſs. You fill your cauldron three quarters full of river water, putting in the root, cut ſmall, in proportion to the quantity of wool to be dyed, and to the ſhade required. When it is very hot, you dip the wool or ſtuff, turning and returning it as before, remembering to air it from time to time; and, if ſtuff, to draw it through the hands in order to ſhake off the ſmall bits of the root, which might elſe ſpot the ſtuff. To avoid theſe ſpots, the root ſhould be tied in a bag. You afterwards dip the lighter ſtuffs, and ſo on, till the colour of the root is exhauſted. If worſted, you always begin with the lighteſt, as for other colours; but of all things you muſt be careful to keep your liquor from boiling at the beginning, as in that caſe the firſt piece of ſtuff would imbibe all the colour.

72
Precautions to be uſed in dyeing with roots.

The method of dyeing with roots is not very eaſy; for if you are not very attentive to the degree of heat, to turning and returning the ſtuffs or worſteds, ſo as to dip them equally, you run a riſk of their being either too dark or ſpotted, for which there is no remedy. In this caſe, the only reſource is to dye them marone, prune, or coffee colour. In order to avoid this evil, you muſt keep the ſtuffs continually turning on the reel, and dip them only piece by piece, nor let the liquor boil till the root has yielded all its colour. The worſteds or ſtuffs dyed in this manner, ſhould be aired, well waſhed, and dried.

Nothing more can be ſaid concerning the bark of alder, than what has been already obſerved with reſpect to the root of the walnut tree, only that letting it boil at the beginning is not of ſo much conſequence, becauſe it yields its colour leſs freely. It is generally uſed for worſteds and colours darkened with copperas. It nevertheleſs produces a good effect on wool not intended for colours extremely dark, and perfectly withſtands the power of the air and ſun.

Sumach is nearly of the ſame nature, and uſed in the ſame manner as the huſks: its colour is not ſo deep, and is rather greeniſh. It is for dark colours frequently ſubſtituted for nut galls; but a greater quantity is requiſite. Its colour is alſo perfectly ſolid and permanent. Theſe different ſubſtances are ſometimes mixed together; and as they are equally good, and produce nearly the ſame effect, there is no great difficulty in obtaining certain ſhades. We muſt, nevertheleſs, be directed by cuſtom in the production of theſe fawn colour ſhades, which abſolutely depend upon the eye, and which are not difficult to manage.

With regard to the mixing of theſe ingredients with ground ſantal, you put four pounds of the latter into the copper, half a pound of nut galls pounded, twelve pounds of alder bark, and ten pounds of ſumach (theſe quantities will dye 25 or 27 ells of cloth). The whole is boiled; and having checked the boiling with a little cold water, you immerſe the cloth, turning and reſtirring it for two hours: it is then taken out, aired, and waſhed in the river. You afterwards dip ſome more ſtuff in the ſame decoction, if you want a lighter ſhade; and in this manner you may contrive as long as the liquor retains any colour. The quantities of theſe ingredients are augmented or diminiſhed in proportion to the depth of the ſhade required, letting the wool or ſtuff boil accordingly.

73
Of dyeing with ſoot.

Here we ſhall deſcribe alſo the manner of dyeing with ſoot, though it has leſs ſolidity than the others, and has alſo the property of hardening the wool, and giving the ſtuff a very diſagreeable ſmell.

The ſoot and water is generally put into the copper at the ſame time, and the whole well boiled. The ſtuff is then immerſed, and more or leſs boiled according to the ſhade required; it is afterwards taken out and cooled, and thoſe intended for the lighteſt ſhade are then put in; they are afterwards well waſhed and dried. But the beſt method is to boil the ſoot in the water for two hours, to let it ſtand afterwards, and then to empty the liquor into another copper, without mixing the ſoot. The wool and ſtuffs are then dipped in the liquor, and are thereby leſs hardened than if they had been mixed with the ſoot: but this does not render the colour more permanent; and indeed it were better never to make uſe of this ingredient, except for ſtuffs of little value, eſpecially as it can be ſupplied by other ingredients already mentioned, and which give a better and more laſting colour, and are beſides more ſoftening to the wool. In the dye they frequently employ the green walnut ſhell, and the root of the walnut tree for their fawn colours. Theſe two ſubſtances are uſeful both for the greater and leſſer dye: there are, however, places where it is difficult to meet with them, and where they are therefore obliged to make uſe of ſaunders and even of ſoot.

74
Of dyeing black.

The laſt of the primitive colours ſo called by the dyers, is black; which includes a vaſt number of ſhades, from the lighteſt grey or pearl-colour to the deepeſt black. Hence it is ranked among the primitive colours in dyeing; for among dyers the word *primitive* does not denote *ſimplicity*, but only being the original colour from whence a number of others are derived. In order to dye woollen ſtuffs of a good black, they ſhould firſt be dyed of a mazareen blue as deep as poſſible; which is called the *baſis* or *ground*, and is to be performed in the manner already directed. The ſtuff ought to be waſhed well in running water as ſoon as it comes out of the vat; and afterwards ſcoured at the fulling mill; which operation is of the utmoſt conſequence, becauſe without it the ſubſequent colour will be greatly injured by the lime in the liquor for dyeing blue. This being done, the colour is finiſhed in the following manner. For 100 pounds of cloth put into a cauldron of a moderate ſize, ten pounds of logwood, cut into chips, and ten pounds of Aleppo galls pulveriſed, the whole encloſed in a bag: theſe ingredients are boiled in a ſufficient quantity of water for 12 hours. A third part of this liquor is emptied into another cauldron, with two pounds of verdigris; the ſtuff is then entered and turned for two hours without ceaſing. It is neceſſary to obſerve that this liquor ſhould boil very ſlowly, or it is ſtill better to keep it very hot without boiling. The ſtuff is then taken out, and the ſecond third of the liquor thrown into the copper to the firſt third, with the addition of eight pounds of copperas. The fire under the cauldron is diminiſhed, and the copperas left to diſſolve for half an hour, letting the liquor cool, after which the ſtuff is kept turning an hour; it is then taken out and cooled. The reſt of the liquor is then mixed with the two firſt thirds, carefully ſqueezing the bag well. To this is added 15 or 20 pounds of ſumach: you give it another boil, and then cool it with a little water; having previouſly added two pounds more of copperas, you again turn the ſtuff for two hours; it is then taken out, cooled, and again put into the cauldron, turning it conſtantly for an hour longer. After this it is carried to the river, well waſhed and ſcoured at the fulling mill. When it is thoroughly ſcoured, and the water comes out of it clear, you prepare a freſh liquor with as much weld as you think proper; you give it one boil, cool it, and dip the ſtuff. This laſt decoction ſoftens and confirms it a very fine black. For the moſt part, however, they do not take ſo much pains; but are ſatisfied, when the cloth is blue, to dip it in a decoction of nutgalls, and to let it boil for two hours. It is afterwards waſhed, and ſome copperas and logwood added to the liquor; after which the ſtuff is again dipped for two hours, and then waſhed and ſcoured.

It may be alſo dyed in the following manner: for 15 ells of cloth, previouſly dyed blue, M. Hellot had a pound and a half of yellow wood, five pounds of logwood, and 10 pounds of ſumach, put into a cauldron. In this the cloth boiled for three hours; after which it was taken out, and 10 pounds of copperas thrown into the copper. When the copperas was diſſolved and the liquor cooled, the cloth was put into it for two hours; it was then taken out and cooled, after which it was again immerſed for an hour, and then waſhed and ſcoured: it was tolerably fine, but not ſo velvety as the preceding.

75 Experiments to determine whether maddering be an advantage in this colour.

It was commanded by the ancient French regulations, that ſtuffs ſhould be maddered after they had been blued, and before they were dyed black. Deſirous of aſcertaining the advantage reſulting from this proceſs, our author took a bit of cloth which had been dyed blue; this being divided, one half was boiled with alum and tartar, and afterwards maddered. It was then blackened in the ſame liquor with the other half which had not been maddered, conformable to the firſt of the two methods juſt deſcribed. They were each of them a very beautiful black; it nevertheleſs appeared that the maddered ſtuff had a reddiſh caſt: the other black was certainly more beautiful, more velvety, and much finer. There is, indeed, leſs danger of the maddered ſtuffs ſoiling the hands and linen, becauſe the alum and tartar of the preparation had carried off all the looſe particles. This advantage is not however ſufficient to make amends for the inconvenience of maddering, as the ſtuff is always in ſome degree injured by the alum and tartar, and as the madder gives it a reddiſh caſt diſagreeable to the eye, and beſides this operation raiſes the price of the dye to no purpoſe.

Some dyers, to avoid theſe inconveniences in part, madder their cloth without having previouſly boiled it in alum and tartar. But madder uſed in this manner has no permanency.

Black is ſometimes dyed without having given it the blue ground; and this method of dyeing is uſed for light or thin ſtuffs of inferior value, conſequently not conſiderable enough to bear the expence of a deep blue previous to their being dyed black. It is however proper at the ſame time to give theſe ſtuffs a ground of the green walnut ſhell, or of the root of the walnut-tree, to avoid the neceſſity of blackening them with too great a quantity of copperas.

This proceſs is attended with no manner of difficulty. The cloth is prepared with the green walnut ſhell, and afterwards blackened in the manner already deſcribed, or as near it as poſſible. For with black, as with ſcarlet, moſt dyers ſuppoſe that they are poſſeſſed of a ſecret for dyeing a much finer black than any of their fraternity; this, however, conſiſts in augmenting or diminiſhing the quantities of the ſame ingredients, or in ſubſtituting others which produce the ſame effect. M. Hellot has tried ſeveral methods; but ſuppoſes that what is ſtrictly meant by ſucceeding to perfection, depends rather on the manner of working, handling, and airing the ſtuff properly, than upon the exact quantity of the ingredients.

76 Why it is neceſſary previouſly to dye the ſtuffs blue.

It may not in this place be improper to explain the reaſon of the neceſſity of giving ſtuffs a blue, or at leaſt a root colour ground, previous to their being dyed black; and why the dyeing white black is expreſsly prohibited in France; becauſe in that caſe it is neceſſary to uſe a much greater quantity of nutgalls: this would indeed be no great evil, as nutgalls of themſelves do not injure the wool; but in order to overcome this gall, according to the workmens phraſe, that is, to blacken it, or properly ſpeaking rather to form an ink on the ſtuff, it requires a greater quantity of coppears, which not only hardens the ſtuff, but, from the acidity impreſſed on the fibres of the wool by this ſalt, makes it brittle: on the contrary, when the ſtuff has had a ground, that is to ſay, a ſtrong layer of ſome deep colour, there is much leſs occaſion for either.

Blue is preferable to any other colour; firſt, becauſe it is the neareſt to black, which is in fact only a deep blue; and, ſecondly, as there is no occaſion for any other preparation than previouſly boiling the wool, the ſtuff is in no reſpect injured. For the ſame reaſon, viz. the preſervation of the wool, the root colour is ſubſtituted for inferior ſtuffs inſtead of the blue, which would enhance the price; it is therefore neceſſary that this root-colour ground ſhould be as deep as poſſible; becauſe the darker it is, there is occaſion for leſs copperas to complete the black.

It alſo frequently happens, that when ſtuffs of any colour are badly dyed or ſpotted, they are dipped in black: it is however adviſable to dip them firſt in blue, unleſs the colour be very dark, in which caſe they would take a very fine black; but this is the laſt reſource. Theſe ſtuffs are not commonly dyed black, if it be poſſible to make them any other colour; becauſe, having been prepared with alum and tartar for the firſt colour, the copperas requiſite for the black would conſiderably injure and greatly diminiſh their quality.

77 How to dye grey colours.

The ſhades of black are greys, from the darkeſt to the lighteſt. They are of great uſe in the art of dyeing, as well for their own colours ſimply as when applied to other colours, which is called *darkening*. At preſent we ſhall mention two methods of producing them. The firſt and moſt general is to boil ſome pounded nutgalls with a proper quantity of water for two hours; at the ſame time diſſolving ſome copperas in a little water ſeparately. Having prepared a cauldron of liquor ſufficient for the quantity of wool or ſtuff to be dyed, you add to it, whilſt the water is too hot for your hand, a little of the decoction of the nutgalls with the ſolution of copperas. The ſtuff intended for the lighteſt grey is then dipped. When ſufficiently coloured according to your deſire, you add ſome freſh decoction of nutgalls with ſome of the infuſion of the copperas, and then dip the next ſhade. In this manner you proceed to the darkeſt ſhade, conſtantly adding theſe liquors, from the tawny grey even to black; but it is much better to give the tawny grey and the extreme dark ſhades a blue ground, more or leſs as you like, for the reaſon above mentioned.

The ſecond method of producing grey ſeems to be preferable; becauſe the juice of the galls is better incorporated with the wool, and you are thereby ſure of uſing no more copperas than is abſolutely neceſſary. It even appears that the greys are more beautiful and the wool brighter. It alſo appears to be equally ſolid; for they are both of them equally proof againſt the air and ſun. The ſecond method is much leſs prejudicial to the quality of the wool, and is attended with no more difficulty than the firſt.

You boil a ſufficient quantity of nutgalls, well pounded and incloſed in a clean linen bag; you afterwards put the wool or ſtuff into this liquor, letting it boil for an hour, moving and ſtirring it about, after which it is taken out. You then add to the ſame liquor a little copperas diſſolved in a part of the ſolution, and then dip the woollens intended for the lighteſt ſhade. You again add a little of the copperas ſolution, continuing in this manner as in the firſt operation till you come to the darkeſt ſhades. In either proceſs, if not reſtrained by patterns, you may catch the preciſe ſhades, beginning with the dark and finiſhing with the light, in proportion as the liquor becomes exhauſted of its ingredients; keeping the pieces of ſtuff or wool immerſed for a longer or ſhorter time, till the ſtuff takes the colour deſired.

It is as impoſſible to determine the quantity of water neceſſary for theſe operations, as it is to ſpecify the quantity of the ingredients, or the time for letting the wool remain in the liquor. The eye muſt judge of theſe things. If the liquor be ſtrongly impregnated with colour, the wool will imbibe the ſhade in a ſhort time; but, on the contrary, it muſt remain longer if the liquor be exhauſted. When the wool is not dark enough, it is dipped a ſecond time, a third, or even more, till it is of a ſufficient colour; the only neceſſary attention is to prevent the water from boiling. If it be by chance too deep, the only remedy is to dip the ſtuff in a freſh warm liquor, adding to it a little of the decoction of nutgalls. This liquor carries off a part of the precipitated iron of the copperas; conſequently the wool or ſtuff becomes lighter.

But the beſt way is to take it out of the liquor from time to time, not leaving it in long enough to imbibe more of the colour than required. It may alſo be dipped in a ſolution of ſoap or alum; but theſe correctives deſtroy a great part of the colour, ſo that it is often neceſſary to darken it again; by this means the wool, which ſuffers greatly by the reiterated action of theſe ingredients, is injured. All greys, however dyed, ſhould be well waſhed in a large ſtream, and the darkeſt even ſcoured with ſoap.

Theſe dingy ſhades, from the lighteſt to the darkeſt, are produced by the ſame operation from which common ink is obtained. The green vitriol contains iron; were it blue, it would contain copper. Pour a ſolution of this green copperas into a glaſs, holding it in the light and dropping into it ſome of the decoction of nutgalls. The firſt drops that fall into this limpid ſolution of ferruginous ſalt produces a reddiſh colour, the next turns it bluiſh, then a duſky violet colour, and at laſt it becomes a dark blue, almoſt black, which is called ink. To this ink add a quantity of pure water; let the veſſel reſt for ſeveral days, and the liquor by degrees becomes clearer and clearer, till it is almoſt as limpid as common water, and at the bottom of the veſſel you will perceive a black powder. Having dried this powder, put it into a crucible; calcine this, and put to it a little ſuet or any other fat, you will obtain a black powder which may be attracted by the loadſtone. This, therefore, is iron; this is the metal which blackens the ink; and this, when precipitated by the nutgalls, lodges in the pores of the fibres of the wool, dilated by the heat of the liquor, and contracted when the ſtuff is expoſed to the air. Beſides the ſtyptic quality of the nutgalls, by which they have eminently the property of precipitating the iron of the copperas and producing ink, they alſo contain a portion of gum, as may be aſcertained by evaporating the filtered decoction. This gum being introduced into the pores with the ferruginous atoms ſerves to retain them; but this gum being eaſily ſoluble, it has not the tenacity procured from a ſalt more difficult of ſolution; therefore theſe dark colours have not the ſolidity of other ſolid colours prepared in a boiling ſolution of alum and tartar, and therefore plain greys have not been ſubmitted to the uſual trial.

78
How to dye ſilk of a black colour.

It is by no means eaſy to produce a good black colour on ſilk, though the baſis is undoubtedly the ſame, viz. iron diſſolved by acids, and precipitated on the cloth by a vegetable aſtringent. The following proceſs is given by M. Macquer. "Twenty quarts of vinegar are put into a trough with one pound of black nutgalls pounded and ſifted, and five pounds of freſh iron-filings. While the infuſion is making, you clean out the copper in which you put the black ground, with the following drugs pounded, viz.

8 lb. of black nutgalls	3 lb. of agaric
8 — of cummin	2 — of *coque de Levant*
4 — of ſumach	10 — of buckthorn
12 — of pomegranate rind	6 — of linſeed.
4 — of bitter apple	

"Theſe ſeveral drugs are put into a copper, containing half the quantity of the veſſel uſed for the black ground, and filled with water. Twenty pounds of Campeachy or logwood chips are afterwards incloſed in a linen bag, for the conveniency of taking them out of the liquor, unleſs you chooſe to take them out with a pierced ladle, or any other means, becauſe theſe muſt boil a ſecond time as well as the other drugs.

“ When the logwood has boiled for about a quarter of an hour, it is then taken out and properly preſerved. The above-mentioned drugs are then put into the logwood decoction, and alſo boiled for about a quarter of an hour, carefully checking with cold water as often as it ſeems ready to boil over.

“ This operation being finiſhed, the liquor is ſtrained through a linen ſtrainer into a trough, and then left to ſettle, carefully preſerving the grounds which muſt be again boiled.

“ The cold infuſion of the vinegar with the nutgalls and iron filings is then put into the copper intended for the black ground. The fire is afterwards put under it, and the following ingredients immediately added, viz.

20 lb. of gum arabic pounded
3 — of realgar or red arſenic
1 — of ſal ammoniac
1 — of ſal. gem.
1 — of mineral cryſtal
1 — of white arſenic pounded
1 — of corroſ. ſublimate
2 lb. of green copperas
2 — of the ſcum of ſugar candy
10 — of powder ſugar
4 — of litharge pounded
5 — of antimony
2 — of orpiment
2 — of plumbago.

Theſe ſeveral drugs ſhould be pounded and ſifted, except the gum arabic, which is only broken.

79
How to uſe the native gums in this operation.

“ Inſtead of gum arabic the native gums may be uſed, and diſſolved in the following manner: Some of the logwood decoction is put into a boiler; when hot, you put into it a copper ſtrainer, made in the ſhape of an egg, and open at the largeſt end. The gum is put into this ſtrainer, and diſſolves as the liquor heats; it muſt be ſtirred with a wooden peſtle, that it may paſs through the holes. When it is entirely paſſed, you introduce another copper ſtrainer, with holes ſtill ſmaller than the former, to prevent the impurities of the gum from eſcaping. The liquor of the gum already diſſolved is poured into this ſtrainer, and again paſſed as before by the help of the peſtle. This operation is made more eaſy, by now and then taking out the ſtrainer and reſting it on a croſs ſhelf or plank, ſuſpended on the peg over the copper uſed for wringing the black. The gum muſt be ſqueezed pretty hard with the peſtle to force it through the holes of the ſtrainer.

“ The gum would diſſolve with more facility if previouſly ſteeped for three or four days in the logwood decoction, eſpecially if you are careful to pour it on very hot.

“ When the above ingredients are put into the black ground, you muſt remember to keep the liquor hot enough to diſſolve the gum and the ſalts, but it ſhould never be ſuffered to boil; and when it is therefore ſufficiently hot, the fire is taken away, and the freſh iron-filings ſprinkled over it in a proper quantity to cover the liquor.

“ The next morning the fire is again put under the copper, the drugs boiled, and the logwood a ſecond time boiled. It is then taken out, and the following drugs added to this ſecond decoction, viz.

2 lb. of black nutgalls pounded
4 — of ſumach
4 — of cummin
5 — of buckthorn berries
6 lb. of pomegranate rinds pounded
1 — of bitter apple
2 — of agaric pounded
2 — of *coque de Levant*
5 — of linſeed

Theſe drugs are boiled, the liquor ſtrained and poured on the black ground as we have already ſaid, and the grounds preſerved. You then put a little fire under the copper as at firſt, and the following drugs are immediately added, viz.

8 oz. of litharge pounded
8 — of antimony pounded
8 — of *plumb de mer*, alſo pounded
8 — of white arſenic pounded
8 — of cryſtal mineral
8 oz. of rock ſalt
8 — of fenugreek
8 — of corroſive ſublimate
8 lb. of copperas
20 — of gum arabic, prepared as above

“ When the liquor is hot enough, you take away the fire, ſtrewing over the liquor with the iron-filings, and letting it ſtand for three or four days.

“ Two pounds of verdigris are then pounded and diſſolved with ſix quarts of vinegar in an earthen pot, adding to it about an ounce of cream of tartar. The whole ſhould boil for a full hour, taking care to check the boiling with cold vinegar that it may not boil over. This preparation ſhould be kept ready to be added to the black ground when you are going to dye.

“ For the black dye the ſilk is boiled as uſual; having waſhed and beetled according to cuſtom, you give the gall liquor for heavy blacks twice, but for light blacks only once. Theſe two blacks are alike both in beauty and ſhade, differing only in the weight of the ſilk: the light black has, however, rather more luſtre.

“ The nutgall liquor is made as follows: For every pound of ſilk you muſt have three-quarters of a pound of light nutgalls, adding the ſame quantity of Aleppo. Theſe galls are pounded together, and boiled for two hours in a quantity of water ſufficient for the whole of the ſilk to be galled. As the liquor waſtes a great deal in the boiling, it is, after the firſt hour, filled again, and after two hours the fire is taken away; the liquor is then left to depoſit, and the galls taken out with a pierced ladle; about an hour afterwards the ſilk is put into it, prepared as above.

During this operation the ſilk is drained and very lightly ſqueezed: it is then immerſed in the gall liquor, on cords one above another, taking care to keep it near the ſurface of the liquor, but ſufficiently covered. In this manner it ſhould remain 12 or 15 hours; it is then taken out, waſhed at the river, and if intended for heavy black, is a ſecond time galled in a freſh galling like the firſt; the grounds are generally uſed for the firſt galling; but for the ſecond a liquor of freſh drugs.

“ Some dyers gall the heavy blacks but once, by boiling the old grounds, taking them out immediately, and afterwards adding freſh galls; for every pound of ſilk a pound of light gall and half a pound of fine Aleppo. The freſh galls they boil for two hours or more, and when the grounds are taken out they put the ſilk in the freſh gall liquor, where they let it remain a day and a night.

"This method, they ſay, is the beſt; becauſe, were the gall grounds to remain in the liquor, they would re-imbibe part of the ſubſtance which they had before given to the water.

"When the ſilk is galled, a little fire is put under the black ground; while it is heating, the ſilk is wrung out of the galling, and beetled at the river.

"When waſhed it is drained on the pegs, paſſing a thread round every hank, each hank as large as for common colours: it is then immediately put on the rods.

"While the black liquor is heating, it ſhould be ſtirred with an iron rake or paddle, to prevent the grounds from ſticking to the bottom of the copper. You then diſſolve ſome French gum by the method above deſcribed, till it riſes on the top in a kind of ſcum covering the ſurface of the liquor; afterwards you throw into it two or three handfuls of linſeed. You then add half of the vinegar and verdigris preparation with about four or five pounds of copperas; this ſhould be punctually repeated at every heating.

"Care ſhould be taken whilſt the fire is under the copper to rake; and, to try if it be hot enough, the rake is moved round at the bottom of the copper; if the gum ſticks to the rake, and the liquor does not appear through the middle of the gummy ſcum, it ſhows that it is hot enough: the fire is then taken away, becauſe, as we have before obſerved, it ſhould not boil. The rake is then alſo taken out, and the liquor covered with iron-filings in the ſame manner as before; after this it is ſuffered to ſubſide for about an hour, when the ſurface of the liquor is again ſtirred, in order to precipitate the filings to the bottom.

"Before we explain the manner of dipping ſilk in the black liquor, it is proper to obſerve that ſilk-dyers never dye black but by coppers, that is when they have a ſufficient quantity of ſilk for three dips, if for heavy black; but if light black only two dips, which is done in the following manner:

"If heavy black, a third of the ſilk is put upon the rods, and three times returned in the black ground; it is afterwards wrung on the peg over the copper; this is done by giving it three twiſts: in this manner three hanks may be wrung at once, becauſe it ſhould be done gently, and only to drain; it is again put on the rods, and ſuſpended between two perches to air.

"While the firſt ſilk is airing, the ſecond third part is dipped in the ſame manner, and afterwards the third third part, always in the ſame manner. It muſt be remembered, that while the ſilk is on the rods it ſhould be turned from time to time to give it air.

"When the laſt third part is wrung, the firſt part is put in, and then the two others ſucceſſively for three times, always airing at each time. This is commonly called giving the three wrings, and theſe three wrings are called one fire or heating.

"The light blacks ſhould alſo have three wrings to one fire.

"After each fire the black ground is again heated, adding copperas and gum as before. This operation is thrice done for the heavy blacks, that is three fires, each fire conſiſting of three wrings; but for light blacks only twice, each alſo conſiſting of three wrings.

"It muſt be obſerved, that at every reheating it is requiſite to change the order of dipping, in ſuch a manner that each may in its turn have the firſt of the liquor. If the black dye is ſtrong and good, the heavy blacks may be done with two fires only; and for the light blacks one wringing leſs may do for each heating.

"When blacks are finiſhed they are returned in a trough of cold water by dips one after another, called by the French dyers *déſroder* or rinſing; they are then twice or thrice beetled at the river. When waſhed you put them on the cords, only taking care not to preſs them too much.

"The ſilk when taken out of the black dye is extremely harſh, which is by no means wonderful, conſidering the number of acids and corroſives in the compoſition. It is therefore neceſſary to ſoften it in the following manner:

80 To ſoften black ſilk.

"Diſſolve about five pounds of ſoap in two buckets of water; and while the ſoap is diſſolving, throw in a handful of aniſeed or any other aromatic plant. It ſhould boil till the ſoap is entirely diſſolved. In the mean time a trough ſhould be provided full of cold water, and large enough to dip all the ſilk at the ſame time. The ſoap-water ſhould be ſtrained through linen, the whole mixed well together, and the ſilk put in, where it ſhould remain a full quarter of an hour. It is then taken out, wrung on the peg, and dried as uſual. As the quantity of ſoap can do no harm, too much is better than too little. This ſoftening is very neceſſary, in order to diveſt the ſilk of that ruſtling and ſtiffneſs ſo prejudicial in the manufacture of black goods.

81 To dye black in the raw.

"To dye black in the raw, the ſilk ſhould be galled in a cold liquor of freſh galls, which had been previouſly uſed for the boiled ſilk. The natural yellow of the ſilk is preferable for this dye, becauſe the white takes a leſs beautiful caſt.

"Having untied the ſilk and divided it into hanks of the common ſize, it is dipped with the hands into the gall liquor. When ſoaked and a little ſqueezed, it is ſtrung on cords, eight or ten hanks together.

They are afterwards put into the cold gall-liquor, one above another, letting even the cords ſink in the liquor, where they may remain for ſix or ſeven days. They are then taken out and once beetled at the river. As to time, it ſhould remain in the galling according to the ſtrength of the liquor and the quantity of the ſilk put into it; but however ſtrong it may be, and however ſmall the quantity of ſilk, it ſhould remain two or three days at leaſt.

"When the ſilk is waſhed, it is again ſtrung on the cords and left to drain, after which the cords are put one over the other into the rinſing or black waſh, which is of itſelf ſufficient to dye; it will, however, require more or leſs time according to the ſtrength of the rinſing waſh, generally about three or four days. Whilſt the ſilk is thus immerſed in the rinſing water, it ſhould be raiſed with ſticks three or four times a-day; it is then drained over the liquor, and when drained put on the ground in a proper place, where it is ſpread and aired, but not dried. This is abſolutely neceſſary to produce the black, elſe the ſilk might take a black-grey; this grey would, however, blacken in the air; nevertheleſs you are thereby enabled to judge how much of the colour it has taken, and how much it may ſtill want. Should the ſilk be ſuffered to dry, it muſt be again wetted before it is re-dipped, which would be an additional and unneceſſary trouble.

"This operation of waſhing and drying muſt be ſucceſſively continued till the ſilk is ſufficiently black.

"The ſilk in this ſituation is carried to the river, and twice beetled; after which it is drained on the cords, and then put on the perches to dry without wringing, which would ſoften it too much: for as this kind of ſilk is deſigned for gauzes and black lace, care ſhould be taken to preſerve its natural ſtiffneſs as much as poſſible.

"To produce black in the raw in the quickeſt manner, the ſilk when waſhed from its galling ſhould be put on the rods and three times returned in the blacking ground; it is then taken out, and put to drain over the veſſel containing the black liquor, and then cooled on the rods.

"When drained, it is again twice dipped in the black liquor, drained, and each time cooled as at firſt. When drained, it is again waſhed; and the procedure is then the ſame as for thoſe which had been dyed in the rinſing. This is not, however, the uſual method of dyeing black in the raw; becauſe it conſumes the black liquor too ſoon, conſidering with what avidity the raw ſilk takes any colour whatever; and beſides that a good rinſing is ſufficiently ſtrong for dyeing this colour.

"The black dye is weakened and becomes exhauſted in proportion to the ſilk it has dyed; it is therefore neceſſary to ſtrengthen and repleniſh, from time to time, by an addition of proper drugs, which is called giving the *brevet* or *compoſition*.

"This compoſition is made by putting four or five buckets of water into a copper, and then boiling it with about four pounds of logwood chips. The logwood is then taken out, and four pounds of black buckthorn berries is added with two pounds of pomegranate rind, two pounds of ſumach, two pounds of *Coque de Levant*, two pounds of coliquinte, two pounds of linſeed, and four pounds of cummin.

"Theſe drugs are boiled together for about three quarters of an hour; the fire is then put under the black liquor, when a little more than half boiled, and whilſt hot the following drugs are added, viz.

2 lb. of realgar
4 — of antimony
1 — of gold litharge
1 — of ſilver litharge
1 — of ſal ammoniac
1 — of rock ſalt
1 — of cryſtal mineral
1 lb. of white arſenic
1 — of corroſive ſublimate
1 — of orpiment
1 — of powder ſugar
1 — of funegreek
4 — of copperas.

"Theſe drugs, when all pounded, are thrown into the black ground, remembering to ſtir. When the compoſition is ſufficiently boiled, it is ſtrained in a trough and left to ſettle; the grounds having ſubſided, the clear part is added to the black ground. The ſame grounds are again boiled and preſerved for ſome other time.

"The compoſition being added to the black liquor, and ſufficiently hot, the fire is taken away. The liquor is then ſtrewed over with the iron-filings, and left to ſettle for two days.

"When the black ground has had a certain number of additions, and a quantity of ſediment collected at the bottom, part of the grounds ſhould be taken out in order to clear the liquor. Thus frequently repleniſhing, the foundation is always preſerved; ſo that the liquor is never entirely new, but having been once ſet in a dye-houſe is ſet for ever. Theſe liquors are never liable to putrefaction, owing to the great quantity of nutgalls and martial vitriol in the compoſition, two of the moſt powerful antiſeptics known.

"The moſt material obſervation concerning the black dye is, that in general it greatly injures the goods in ſuch a manner that ſtuffs of this colour, though not inferior in other reſpects, wear out much ſooner than thoſe of any other. This defect may be attributed to the vitriolic acid of the copperas, which is but imperfectly ſaturated with the iron. Iron combined with any, even vegetable, acid, is capable of producing black with vegetable aſtringents. It is therefore moſt probable that this inconvenience might poſſibly be removed, by ſubſtituting other combinations of this metal for the copperas, if it were worth while to make the attempt."

82
Of dyeing ſilks grey.

"All kinds of grey, excepting black grey, are produced upon ſilk without aluming. The ſilk being waſhed from the ſoap and drained on the peg, a liquor is made of fuſtic, logwood, archil, and copperas. Fuſtic gives the ground; archil the red; logwood darkens, and the copperas ſoftens all theſe colours, turns them grey, and at the ſame time ſerves inſtead of alum in extracting them. As there is an infinite variety of greys without any poſitive names, and produced by the ſame methods, it would be endleſs to enter into a detail that would prolong this treatiſe to ſo little purpoſe.

Suffice it to remark here, that in producing a reddiſh grey the archil ſhould predominate; for thoſe more grey, the logwood; and for thoſe ſtill more ruſty and rather greeniſh, fuſtic.

In general, when obliged to complete the colour with logwood, it ſhould be uſed rather ſparingly, becauſe it is apt in drying to darken too much, differing in this particular from all other colours.

To give an example of the manner of producing theſe colours we ſhall take the nut-grey.

The fuſtic decoction, archil, and a little logwood, is put into water moderately hot. The ſilk is then returned, and when the liquor is exhauſted it is taken out; and to ſoften the colour the copperas ſolution is added. Some dyers for this purpoſe add the black waſh inſtead of the copperas; the ſilk is again returned; and if the colour does not appear ſufficiently even, ſome red ſpots ſtill remaining, it may be concluded that it requires a little more copperas.

It muſt alſo be remembered, that as copperas is the general baſe of all greys, if deficient in quantity, the colour will be apt to change in drying, and to become rough and uneven.

To try if the colour be ſufficiently ſoftened, it ſhould be examined; and if it wets eaſily, after having been wrung on the peg, it wants copperas; but if on the contrary it ſoaks with a little difficulty, the colour is enough ſoftened.

On the other hand, too much copperas ſtiffens the ſilk conſiderably, making it harſh, and even depriving it of a great part of its luſtre. To remedy this, the ſilk when taken out of the liquor ſhould be wrung on the peg, and then immediately waſhed at the river, which carries off the ſuperfluous copperas.

The black greys, becauſe alumed and welded, make a ſeparate claſs. When the ſilk is alumed and cooled at the river, and the weld liquor prepared as for yellows, the ſilk is returned; and when the liquor is exhauſted, a part of it is thrown away, and the logwood decoction ſubſtituted in its place. The ſilk is again returned in this liquor; and when the logwood is exhauſted, ſome copperas may be added in a ſufficient quantity to blacken the colour. The ſilk is then waſhed, wrung, and finiſhed as uſual.

For iron grey, it is neceſſary to boil the ſame as for blues. This colour is much more beautiful when laid on a very white ground. It is more uſed in the manufacturing of ſtockings than any other colour, therefore generally wrought in ſhades; that is, many different ſhades made at the ſame time.

When the ſilk is waſhed and prepared as uſual, you make the liquor of river or well water, no matter which; but either muſt be cold.

If river water, the logwood decoction made with river water is added, ſufficient to produce the dark ſhade required; the ſilk is then dipped, and when finiſhed it is wrung and hung up. A part of the liquor is then thrown away and repleniſhed with water for the following ſhades, and ſo on to the lighteſt, carefully dividing; that is, preſerving an equal diſtance between the ſhades.

When all is finiſhed with the logwood, the dark ſhades are put again on the rods, to be dipped in a new liquor with the addition of copperas; the remaining lighter ſhades are then dipped in the ſame liquor, but without the copperas addition: if, however, the ſecond ſhade is not enough ſoftened, a little copperas muſt be added. This defect is eaſily perceived in the dipping, as we have before obſerved.

When arrived at the lighteſt ſhades, care ſhould be taken that the liquor be not overcharged with copperas, which is eaſily perceived by its having a reddiſh caſt; in which caſe ſome of the liquor ſhould be thrown away and repleniſhed with water, too much copperas producing the ſame effect with regard to theſe ſhades as the preceding.

When the liquor is made with well water, the logwood decoction ſhould alſo be made of well water. This being added to the liquor, the darkeſt ſhades are firſt dipped as in the preceding proceſs. When the ſilk has ſufficiently drawn, it is taken out, and the following ſhades are then dipped, but without repleniſhing, the colour being much better and clearer without the river water.

When all the ſhades are complete, you ſoften with copperas, in the ſame manner as above deſcribed; the ſilk is afterwards waſhed, and if neceſſary beetled.

83
To diſcharge grey colours from ſilk.

To diſcharge greys, that is when the ſhades are too dark and too full, you put ſome tartar pounded in a mortar and ſifted into a bucket or ſmall trough; you then pour over it ſome boiling water. The cleareſt of this liquor is afterwards put in a trough, and the ſilks returned in it; by which operation a part of the colour is immediately diſcharged.

If the ſilk does not inſtantly take an equal colour, a little more tartar muſt be added as above mentioned.

The ſilk thus diſcharged of its ſuperfluous colour is once beetled at the river, and afterwards dipped in hot water, without any other addition. This laſt operation reſtores in part what it had loſt by the tartar; but to try the colour it ſhould be wrung on the peg.

The tartar always deſtroying ſome part of this colour, it ſhould be reſtored with a freſh liquor made for the purpoſe, and then ſoftened with copperas as uſual.

If the ſilk has been alumed, then the hot water may be omitted after the beetling; the hot water is, however, always of uſe in removing the harſhneſs occaſioned by the tartar.

To diſcharge iron greys when too dark, they ſhould be ſulphured, afterwards beetled at the river, and then again dipped in a freſh liquor ſimilar to the firſt.

This method of diſcharging iron greys is preferable to either tartar or lemon juice, theſe ingredients giving them a ground that does not eaſily yield even to the boiling with ſoap, which conſequently ſpoils the colour; whereas the ſulphuring almoſt entirely whitens the ſilk by totally deſtroying the logwood.

For greys in the raw, the ſilk ſhould be as white as for common colours, except the black grey, for which the natural yellow would be no diſadvantage. Having ſoaked the raw ſilk, the proceſs is then the ſame for producing theſe ſhades as on boiled ſilk.

84
Of dyeing cotton or linen black.

Cotton or linen receive a black colour with ſtill more difficulty than ſilk. "The various proceſſes (ſays M. de Apligny) for dyeing black, agree in the ſole intention of introducing within the pores of the ſtuff ferruginous particles diſſolved in different menſtrua, and of precipitating them on the ſtuff by means of aſtringent ſubſtances furniſhed with phlogiſton capable of colouring iron black. The beſt method therefore of ſucceeding, is to chooſe a ſolvent capable of dividing the particles ſo minutely that the calx may not injure the ſtuff. Copperas or green vitriol are uſed in theſe proceſſes; but the iron it contains is by no means in a ſtate of perfect diviſion, on account of the phlogiſton obſtinately retained by it, which facilitates its union with the acid without the iron being perfectly diſſolved. It is for this reaſon, doubtleſs, that a ſolution of green vitriol in water depoſites in lime a ſpecies of ochre; which, according to M. Geoffroy, ſeems to be an extraneous ſubſtance. For the ſame reaſon the ſpirit of nitre, ſaturated with iron, will diſſolve ſtill more, by abandoning the groſſer particles of what is held in ſolution, and of which it retains only the phlogiſton.

85
Cauſe of the rottenneſs frequent in black ſtuffs.

"This being the caſe, whenever copperas is uſed in dyeing of black, the ſtuffs dyed are generally harſh to the feel and conſiderably damaged; becauſe the groſs particles of the iron being only divided, and not diſſolved by the vitriolic acid of the copperas, overfill the pores of the ſtuff into which they had entered, and by their hardneſs extending the partition of theſe pores, force them aſunder. M. Hellot very well obſerves, that cloth dyed black without a blue or root ground requires a greater quantity of copperas, by which the ſtuff is rendered rotten; but I have alſo remarked, that when diſſolving the ruſt of iron in vinegar, either for yellow or for the black of painted linens, it is apt to tear in the parts where theſe colours are applied, particularly if there has been no attention to take off the groſſer earth by ſcumming the ſolution. To this earth therefore the rottenneſs of black ſtuff may be attributed; and not, as vulgarly imagined, to the ſalt of vitriol, nor to any other burning cauſe.

86 Compoſitions for dyeing black improved by age.

"And therefore, in order to render the colour more equal, and the ſtuffs leſs damaged, the beſt method for black is to uſe a ſolution of iron perfectly divided. Conſequently, as experience daily teaches, thoſe acids which attack the iron too rapidly are the leaſt proper to produce a perfect ſolution of this metal. Weak acids are therefore preferable; which, notwithſtanding their ſlow operation, penetrate entirely, dividing it into impalpable particles. Black compoſitions alſo ſucceed much better in proportion as the black liquor is older, and conſequently the ſolution of the iron more complete. The manufacturers in India are ſo truly ſenſible of this conſequence, that many of them preſerve their black vats for more than 20 years. In the ſtates of Genoa, Florence, and Naples, every manufacturing city has a place of reſerve, called the *Seraglio*, where at the public expence eight or ten vats are continually ſupported. Theſe vats have been ſet from 300 to 400 years, more or leſs; that is, prepared for the dipping of ſilk deſigned for black, and requiring only to be ſupplied with proper drugs in proportion as they are diminiſhed by uſe. The ground remaining always the ſame, forms a kind of leaven, by which the fermentation of the neceſſary additional drugs is aſſiſted.

87 Rouen proceſs for dyeing cotton or linen black.

"The proceſs at Rouen for dyeing linen and cotton thread black, is firſt to give it a ſky-blue ground, and then to wring and dry. It is afterwards galled, a quarter of a pound of galls for every pound of the ſubſtance (as for reds); having remained 24 hours in the gall liquor, it is again wrung and dried.

"About five quarts of the black liquor for every pound is then poured into a trough. The cotton is then dipped and worked with the hand, pound by pound, for about a quarter of an hour, then wrung and aired. This operation is twice repeated, adding each time a freſh quantity of the black liquor carefully ſcummed. It is again aired, wrung, waſhed at the river, well drained, and dried.

"When this cotton is to be dyed, about one pound of the rind of the alder-tree for every pound of thread is put into a copper and boiled in a ſufficient quantity of water during one hour. About half the liquor that had been uſed for the galling is then added, with about half the weight of the rind of the alder of ſumach. The whole is again boiled for two hours, after which it is ſtrained through a ſieve. When it is cold, the cotton is dipped in it on the rods, and worked pound by pound; from time to time airing, and returning it into the liquor; where having remained 24 hours, it is wrung and dried.

"For ſoftening this cotton when too harſh, it is the cuſtom to ſoak it in the remainder of the weld-liquor that had been uſed for other colours, adding a little of the logwood-liquor. It is then taken out, and inſtantly plunged into a trough of warm water, into which had been poured about an ounce of the oil of olives for every pound of the ſubſtance: it is then wrung and dried.

88 Proceſs of the Abbé Mazéas.

"M. l'Abbé Mazéas has given a proceſs for the dyeing of linen and cotton thread black, by maddering after having prepared with the ſickiou of the Adrianople red, galling and dipping in an aſtringent compoſed of lime-water and green copperas calcined. This proceſs, though long and expenſive, is in my mind no better than thoſe I have juſt deſcribed. In order to obtain a permanent black, it is my opinion that we muſt ſtill have recourſe to the black reſulting from a combination of the three primitive colours, until we diſcover feculæ capable of yielding a direct black. I ſhall now deſcribe a proceſs in which I myſelf have ſucceeded perfectly.

89 Of M. de Apligny, by a combination of colours.

"To dye linen and cotton thread black by a combination of colours, it is neceſſary to begin by cleanſing the thread as uſual by galling, in the ſame manner as mentioned in the article upon red, aluming afterwards, and then dipping in a weld-liquor. When taken out of this liquor, it muſt be dyed in a decoction of logwood, to which has been added a quarter of a pound of blue vitriol for every pound of the ſubſtance. It is then taken out, waſhed at the river, wrung, and waſhed ſeveral times, but not wrung hard. It is at laſt dyed in a madder liquor, about half a pound of this dye for every pound of the ſubſtance. It is needleſs to repeat here the manner of galling, aluming, and welding, &c. having deſcribed them above. By this proceſs we may reſt aſſured of obtaining a very beautiful and permanent black, that will not be liable to be diſcharged, provided that after having been dyed the thread be dipped in a boiling ſoap-liquor.

90 Of dyeing cotton and linen of a grey colour.

"Several different ſhades of grey are diſtinguiſhed in the art of dyeing; *viz.* black-grey, iron-grey, ſlate-grey, thorn-grey, agate-grey, &c. It is eaſy to conceive, that grey in general, being a mixture of black and white, its different ſhades can be obtained only by introducing into the ſubject a ſmall quantity of matter, by which the rays of light are abſorbed in ſuch a manner, that ſome of the pores not being occupied, reflect all the rays, and preſent to the eye a grey colour by means of the black particles contained in the intermediate pores. This operation in dyeing is therefore preciſely the ſame as in painting, which produces grey by a mixture of lamp-black and of white lead.

"It would be too tedious, and even ſuperfluous, to deſcribe the different proceſſes for the ſeveral greys juſt mentioned. The dyer will be better able to judge of theſe ſhades by his eye than by any particular rules. All that can be ſaid is, that it is the common practice to give a blue ground to black-grey, iron-grey, and ſlate-grey; but to none of the others. Theſe ſhades require aluming in proportion to the ſhade wanted, and are even frequently galled with liquors that had been previouſly uſed.

"The thread having been firſt galled, wrung, and dried, is dipped on the rods in a trough full of cold water, adding an arbitrary quantity of the black liquor and of the logwood decoction. The thread is then worked pound by pound, waſhed, wrung, and dried.

"It is poſſible to produce more permanent greys by the two following proceſſes. Firſt, by galling the thread, by dipping in a very weak black vat or liquor, and afterwards maddering. Secondly, by dipping the thread in a very hot ſolution of cryſtals of tartar, lightly wringing, and then drying. The thread is then dyed in a decoction of logwood. It appears black; but by dipping the thread, and working it attentively in a hot ſolution of ſoap, the ſuperfluous dye being diſcharged,

ged, it remains a ſlate-grey, very pretty and very permanent."

91 Of compound colours.

Having deſcribed in ſuch a particular manner the methods of dyeing the primitive colours, there can be very little difficulty in comprehending the management of thoſe which proceed from a mixture of them. But though an infinite number of different ſhades may be formed from thoſe already mentioned, we are not to imagine that a good colour will be produced by the mixture of any two at random. Thus, though you mix blue and ſcarlet together in any way you pleaſe in order to produce a purple, the colour will neither be good nor uniform, owing to the oppoſite action of the acid and alkaline ingredients by which theſe two primitive colours are ſtruck. With crimſon the caſe is altered: for, as we have already ſeen, that colour is produced in the greateſt perfection where volatile alkali is concerned; and therefore the alkaline ingredients of the blue, which can only tend to heighten that property in the other colour, have no ſuch pernicious tendency.

92 Purple, &c.

From a mixture of blue and crimſon, therefore, are produced columbine, purple, amaranth, penſy, violet, with innumerable other ſhades, varying according to the depth of the original colours employed. In all theſe compound colours, it is neceſſary to dye the ſtuff completely of one colour, and then proceed with it for the other exactly as if it had been quite white. In the preſent caſe, you muſt begin with blue; becauſe, though the indigo cannot be hurt by the ingredients neceſſary for dyeing crimſon, yet the cochineal would be very conſiderably injured by the lime uſed for diſſolving the indigo. Colours of an inferior kind are produced from madder.

93 Green.

Blue and yellow produce a green, which is always eſſentially the ſame; though there are alſo innumerable ſhades of it which go by different names, as yellow-green, pale-green, bright-green, graſs-green, ſea-green, olive-green, &c. &c. Theſe are all dyed by the general method already mentioned, *viz.* a yellow dye ſuperadded to a blue ground; though they differ in ſome particulars in reſpect to the various ſhades above mentioned.

For yellow-greens, M. Hellot directs the ſtuff to be a fine light blue, boiled with the common quantities of alum and tartar, and then dipped in the yellow dye in order to receive a ſtrong colour, that the yellow may predominate. For thoſe ſhades called *cabbage* and *parrot greens*, or any others more inclining to blue, it is requiſite that the latter ſhould be very deep and the yellow dye weak, or that a ſmaller quantity of ſalts ſhould be uſed in the preparation. This laſt method, however, is not approved of by M. Hellot; and indeed it is natural to think, that a great quantity of colour with little of the preparation neceſſary to make it adhere and brighten it, muſt be much leſs durable, as well as leſs beautiful, than one where the colour and preparation are in due proportion to one another.

A very beautiful green will be produced by dipping a deep blue cloth in the decoction of the virga aurea Canadienſis, provided the ſtuff after being dyed blue has been boiled in a ſolution of three parts of alum and one of white tartar. This green is equally permanent with that dyed with weld. A very permanent-green is alſo produced by the bark of the aſh-tree, but leſs beautiful than the other. A duck's-wing green is produced by uſing the root of the ſharp-pointed dock groſsly powdered and in ſufficient quantity. For this the ſtuff muſt be dyed firſt of a dark blue; then well ſcoured, and afterwards boiled in a ſolution of four parts of alum and one of tartar; and, laſtly, it muſt be boiled full two hours with the other colouring ingredient the dock-root. By this root alſo many various ſhades of colour may be obtained from the paleſt yellow to a tolerable olive; ſo that our author thinks it is a conſiderable acquiſition in the art of dyeing.

94 Dutch method of dyeing ſea-green.

Sea-green is uſually dyed, according to M. Hellot, with verdigris; and the following, he ſays, is the Dutch method of doing it, and which produces a more permanent colour than uſually is obtained by means of that ingredient. "Two cauldrons are to be placed at a little diſtance from each other; in one of which you put two pieces of cloth of 40 or 50 ells in length, with eight or ten pounds of white ſoap ſhaved, and which muſt be perfectly diſſolved. When the mixture is ready to boil, the ſtuff ſhould be immerſed, and ſuffered to boil a full half hour. In the other cauldron you muſt prepare another liquor; and when that is quite hot, you put into it a clean linen bag, containing eight or ten pounds of blue vitriol, and ten or twelve of lime, each of them well pulverized and mixed together; it being neceſſary that the mixture ſhould be as accurate as poſſible. This bag ſhould be moved about in the water, hot, but not boiling, till the vitriol is diſſolved. A winch is then to be fixed on in the uſual manner; but which ought to be carefully wrapped round with a clean linen cloth very tight and well ſewed. One end of the cloth is fixed on the winch, which is then turned ſwiftly round, that the cloth may paſs ſwiftly from the ſoap-cauldron into that with the vitriol; and here it is turned more ſlowly, that it may have time to imbibe the particles of the copper, which by means of the lime were diffuſed in the liquor by ſeparating and precipitating them from the blue vitriol in which they were contained. The cloth is left in this liquor, which ſhould never boil till the cloth has taken the ſea-green colour deſired. It is then to be taken out, drained on the winch, and aired by the lifting. It ſhould hang till it is perfectly cold before it be waſhed at the river. If it touches wood it will be ſpotted; for which reaſon, the winch, and every thing of wood over which it muſt paſs, ought to be well covered with linen."

On examining this proceſs by the principles of chemiſtry, it appears to be no other than impregnating the cloth with a ſolution of copper in fixed alkali. It is undoubtedly a miſtake to ſay, that it is done by verdigris; for no verdigris can be formed from blue vitriol, lime, and ſoap. All that we can ſay of it is, that it is cloth impregnated with a combination of copper with fixed alkali; which being naturally extremely ready to unite with water, and having very little attraction for the cloth, the latter may be ſuppoſed to be painted rather than dyed with it. A much better method, therefore, ſeems to be that recommended by M. Hellot, of firſt dyeing the ſtuff a very light blue, and then giving the neceſſary yellow with virga aurea.

Theſe receipts may ſerve as ſpecimens of the methods of dyeing all kinds of mixed colours. There are, however, methods of producing both a blue and green from indigo itſelf, by diſſolving it in acids; and

95 Saxon blue and green.

the colours ſo produced are called *Saxon blues* and *greens*. Being periſhable colours, they are now ſeldom uſed; though Mr Wolfe ſome time ago publiſhed a receipt in the Philoſophical Tranſactions for preparing them after an improved method. This method, for the blue, was to diſſolve indigo in concentrated oil of vitriol by digeſting them in the heat of boiling water inſtead of ſand, which had formerly been uſed, and was apt to ſpoil the colour. After the ſolution of the indigo, the liquor may be weakened at pleaſure; and any piece of cloth dipped in it will imbibe a dye deeper or lighter according to the quantity of colour it contains. This colour is very beautiful, but apt to prove unequal; and, as has been already ſaid, extremely periſhable. For the Saxon green it is neceſſary to have a yellow from indigo alſo, which is obtained by diſſolving it in ſpirit of nitre. Mr Wolfe recommends an ounce and an half of powdered indigo to be mixed with two ounces of ſpirit of nitre diluted with four times its quantity of water. The mixture is then to ſtand for a week, and at the end of that ſpace is to be digeſted in a ſand heat for an hour or more; after which four ounces more of water are to be added. The ſolution, when filtered, will be of a fine yellow colour. Strong ſpirit of nitre, when mixed undiluted with indigo, is apt to ſet fire to it; for which reaſon the water is added. Even in its diluted ſtate, it will froth and run over if the digeſtion be performed within 24 hours after the mixture; and on this account it is allowed to remain a week in the cold. One part of the ſolution of indigo in the acid of nitre, mixed with four or five parts of water, will dye ſilk or cloth of the paleſt yellow colour, or of any ſhade to the deepeſt, by letting them boil a longer or ſhorter time, adding water as the liquid evaporates. The addition of alum makes the colour more laſting. None of the colour ſeparates in the operation but what is imbibed by the cloth, and therefore this liquid goes very far in dyeing. That part of the indigo which remains undiſſolved in the vitriolic acid, when collected by filtration and diſſolved in ſpirit of nitre, will dye ſilk and wool of all ſhades of brown inclining to yellow.

96 M. de Apligny's remarks on this proceſs.

On the proceſs for dyeing Saxon blue M. de Apligny obſerves, that there is no real ſolution of the indigo in the acid of vitriol, but that it is only divided into very fine particles and ſuſpended in the liquor; neither can any alteration be made in it by an alteration in the proceſs. Nor does this make any exception to the general rule in chemiſtry, that acids diſſolve and redden the blue colouring matter of vegetables; it not being their nature to act upon feculæ ſuch as indigo, but upon vegetable juices, the colour of which depends on the ſalts and eſſential oil of the plant. For the truth of his aſſertion he appeals to the appearance of the liquor prepared for dyeing Saxon blue.

97 Materials for dyeing leſs numerous than might be ſuppoſed.

From the vaſt profuſion of colours which nature exhibits in the flowers which grow every where around us, it is natural to think that the materials for dyeing might be had in the greateſt plenty without any neceſſity of having recourſe to foreign countries. But this is far from being the caſe: for ſcarce one of our blue or red flowers can be made to communicate any durable colour to cloth; while, on the other hand, almoſt all the yellow ones may be made to do ſo. Numberleſs experiments have been made to determine the plants which might be really uſeful to dyers; and moſt that have yet been found fit for their purpoſe in Britain are comprehended in the following liſt.

YELLOWS.	
Bark of buckthorn,	*Rhamnus catharticus.*
berry-bearing alder,	———- *frangula.*
berberry,	*Berberis vulgaris.*
plum-tree,	*Prunus domeſtica.*
apple-tree,	*Pyrus malus.*
hornbeam,	*Carpinus betulus.*
Root of meadow-rue,	*Thalictrum flavum.*
common nettle,	*Urtica dioica.*
Herb, ſaw-wort,	*Serratula tinctoria.*
buſhy hawkweed,	*Hieracium umbellatum.*
hemp-agrimony,	*Bidens tripartita.*
gale, or Dutch myrtle,	*Myrica gale.*
ſweet willow,	*Salix pentandra.*
birch-tree,	*Betula alba.*
hedge-nettle,	*Siachys ſylvatica.*
ſpotted arſmart,	*Polygonum perſicaria.*
yellow looſeſtrife,	*Lyſimachia vulgaris.*
devil's-bit,	*Scabioſa ſucciſa.*
kidney-vetch,	*Anthyllis vulneraria.*
common yellow liverwort,	*Lichen parietinus.*
Flowers of St John's wort,	*Hypericum perforatum.*
REDS.	
Roots of ladies bedſtraw,	*Galium verum.*
herb woodroof,	*Aſperula tinctoria.*
ſorrel,	*Rumex acetoſa.*
tormentil,	*Tormentilla erecta.*
purple cinquefoil,	*Comarum paluſtre.*
PURPLES.	
Herb, or tops of wild marjoram,	*Origanum ſylveſtre.*
BLUES.	
Bark of the aſh,	*Fraxinus excelſior.*
Flowers of larkſpur,	*Delphinium conſolida.*
bell-flower,	*Campanula rotundifolia.*
Berries of black heath,	*Empetrum nigrum.*
GREENS.	
Herb of ragwort,	*Senecio Jacobæa.*
cow-weed,	*Chærophyllum ſylveſtre.*
Panicle of brome-graſs,	*Bromus ſecalinus.*
common reed,	*Arundo phragmites.*
BLACKS.	
Bark of oak,	*Quercus robur.*
Water horehound,	*Lycopus europæus.*

98 How to diſcharge colours when dyed.

As it is often neceſſary to give another colour to ſtuffs which have been already dyed, it is plain, that it is as neceſſary for a dyer to know how to diſcharge colours as how to make the cloth imbibe them.—Concerning this, it is only neceſſary to obſerve, that alkaline ſalts are in general the beſt, and, where the colours are well dyed, the only means of diſcharging them. If a piece of cloth is dyed with logwood, and the colour ſtruck upon it with alum, that colour will be nearly diſcharged by oil of vitriol, or any other ſtrong acid; but if ſolution of tin has been employed in ſtriking the colour, acids have then no effect, and alkalies only can be employed. Neither will they diſcharge the colour totally, but the ſtuff muſt be bleached for ſome time to get out the remainder. If alkaline ſalts cannot be employed with ſafety to the ſtuff, it is then impoſſible to dye it any other colour than black; unleſs it be dyed a compound colour, of which the original one is a component part.

98 Weight added to ſilk by different ſubſtances.

Concerning the weight that colours give to ſilk (in which it is moſt taken notice of, being ſold by weight, and a commodity of great price), it is obſerved, that one pound of raw ſilk loſeth four ounces by waſhing out the gums and the natural ſordes; that the ſame ſcoured ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black with ſome materials. Of all the materials uſed in dyeing, eſpecially of black, nothing increaſes weight ſo much as galls, by which black ſilks are reſtored to as much weight as they loſt by waſhing out their gum; nor is it counted extraordinary, that blacks ſhould gain about four or ſix ounces in the dyeing upon each pound. Next to the galls, old fuſtic increaſes the weight about 1½ in 12; madder, one ounce; weld, half an ounce; the blue vats in deep blues of the fifth ſtall give no conſiderable weight; neither do logwood, cochineal, nor even copperas, where galls are not uſed.

Dyeing *of Hats*. See Hats.

Dyeing *of Leather*. See Leather.

Dyeing, or *Staining*, of paper, wood, bone, marble, &c. See Bone, Marble, Paper, Wood, &c.

DYNASTY, among ancient hiſtorians, ſignifies a race or ſucceſſion of kings of the ſame line or family. Such were the dynaſties of Egypt. The word is formed from the Greek δυναςεια of δυναςευω, *to be powerful*, or *king*.

The Egyptians reckon 30 dynaſties within the ſpace of 36,525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that theſe dynaſties are not continually ſucceſſive, but collateral.

DYRRACHIUM (anc. geog.), a town on the coaſt of Illyricum, before called *Epidamnum*, or *Epidamnus*, an inauſpicious name, changed by the Romans to *Durrachium;* a name taken from the peninſula on which it ſtood. Originally built by the Corcyreans. A Roman colony (Pliny). A town famous in ſtory: its port anſwered to that of Brunduſium, and the paſſage between both was very ready and expeditious. It was alſo a very famous mart for the people living on the Adriatic; and the free admiſſion of ſtrangers contributed much to its increaſe: A contraſt to the conduct of the Apollonians; who, in imitation of the Spartans, diſcouraged ſtrangers from ſettling among them.

DYSÆ, in mythology, inferior goddeſſes among the Saxons, being the meſſengers of the great Woden, whoſe province it was to convey the ſouls of ſuch as died in battle to his abode, called *Valhall*, i. e. the hall of ſlaughter; where they were to drink with him and their other gods *cereviſia*, or a kind of malt liquor, in the ſkulls of their enemies. The *Dyſæ* conveyed thoſe who died a natural death to *Hela*, the goddeſs of hell, where they were tormented with hunger, thirſt, and every kind of evil.

DYSCRASY, among phyſicians, denotes an ill habit or ſtate of the humours, as in the ſcurvy, jaundice, &c.

DYSENTERY, in medicine, a diarrhœa or flux, wherein the ſtools are mixed with blood, and the bowels miſerably tormented with gripes. See Medicine-*Index*.

DYSENTERIC fever. *Ibid.*

DYSERT, a parliament town of Scotland, in the county of Fife, ſituated on the northern ſhore of the frith of Forth, about 11 miles north of Edinburgh.

DYSOREXY, among phyſicians, denotes a want of appetite, proceeding from a weakly ſtomach.

DYSPEPSY, a difficulty of digeſtion.

DYSPNOEA, a difficulty of breathing, uſually called *aſthma*.

DYSURY, in medicine, a difficulty of making urine, attended with a ſenſation of heat and pain. See Medicine-*Index*.

DYTISCUS, water-beetle, in zoology, a genus of inſects of the order of the coleoptera; the antennæ of which are ſlender and ſetaceous, and the hind feet are hairy, and formed for ſwimming. There are 23 ſpecies, diſtinguiſhed by their antennæ, the colour of the elytra, &c.

Plate CLXIV.

The larvæ of the dytiſcus are often met with in water. They are oblong, and have ſix ſcaly feet. Their body conſiſts of eleven ſegments. The head is large, with four filiform antennæ and a ſtrong pair of jaws. The laſt ſegments of their body have rows of hairs on the ſides; and the abdomen is terminated by two ſpines charged with the like hairs, forming a kind of plumes. Theſe larvæ are frequently of a greeniſh variegated brown: they are lively, active, and extremely voracious: they devour and feed upon other water-inſects, and often tear and deſtroy each other. The perfect inſect is little inferior to its larvæ in voraciouſneſs, but it can only exerciſe its cruelty on the larvæ; the perfect inſects, like himſelf, being ſheltered by the kind of ſcaly cuiraſs with which they are armed. This creature muſt be touched cautiouſly; for beſides its power of giving a ſevere gripe with its jaws, it has moreover, under the thorax, another weapon, a long ſharp ſpine, which it will drive into one's fingers by the effort it makes to move backwards. The eggs of the dytiſci are rather large, and are by them incloſed in a kind of ſilky duſkiſh cod, of a ſtrong and thick texture, in form round, and terminated by a long appendix or ſlender tail, of the ſame ſubſtance. Theſe cods are often found in the water, and from them are brought forth the eggs and larvæ of the dytiſci. The ſtrength of theſe cods probably ſerves the inſect to defend their eggs from the voraciouſneſs of ſeveral other aquatic inſects, and even from that of their fellow-dytiſci, who would not ſpare them.

Many ſpecies of the perfect inſect are common in ſtagnated waters, which they quit in the evening to fly about. They ſwim with incredible agility, making uſe of their hinder-legs after the faſhion of oars. The elytra of the females are in general furrowed, and thoſe of the male plain: when they firſt arrive at their perfect ſtate, their elytra are almoſt tranſparent, and in many ſpecies of a beautiful dun colour, mingled with ſhades of greeniſh brown. The beſt method of

Dyvour. catching them is with a hand-net or ſieve; for they are ſo nimble, and exerciſe their defenſive weapons ſo often, and with ſuch painful ſucceſs, to thoſe who endeavour to catch them, that they are very often obliged to let them eſcape; the eaſieſt way to kill them, is to let them fall into boiling hot water, which inſtantly deſtroys them.

DYVOUR, in Scots law; otherwiſe *Bare-man:* A perſon who, being involved in debt, and unable to pay the ſame,—for avoiding impriſonment and other pains, makes ceſſion of his effects in favour of his creditors; and does his *devoir* and duty to them, proclaiming himſelf bare man and indigent, and becoming debt-bound to them of all that he has. The word is uſed in the ſame ſenſe as Bankrupt: ſee that article; and Law. N° clxxxv, 11, 12. clxxii. 10, 11, 12, &c.

E.

E, Eachard. E THE ſecond vowel, and fifth letter of the alphabet. The letter E is moſt evidently derived from the old character Ǝ in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this poſition E, and not from the Hebrew He ה. From the ſame origin is alſo derived the Saxon *e*, which is the firſt letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are uſed nearly in the ſame manner as in that letter.

It has a long and ſhort ſound in moſt languages. The ſhort ſound is audible in *bed*, *fret*, *den*, and other words ending in conſonants: its long ſound is produced by a final *e*, or an *e* at the end of words; as in *glebe*, *here*, *hire*, *ſcene*, *ſphere*, *interfere*, *revere*, *ſincere*, &c. in moſt of which it ſounds like *ee;* as alſo in ſome others by coming after *i*, as in *believe*, *chief*, *grief*, *reprieve*, &c. and ſometimes this long ſound is expreſſed by *ee*, as in *bleed*, *beer*, *creed*, &c. Sometimes the final *e* is ſilent, and only ſerves to lengthen the ſound of the preceding vowel, as in *rag*, *rage*, *ſtag*, *ſtage*, *hug*, *huge*, &c. The ſound of *e* is obſcure in the following words, *oven*, *heaven*, *bounden*, *fire*, *maſſacre*, *maugre*, &c.

The Greeks have their long and ſhort *e* which they call *epſilon* and *eta*. The French have at leaſt ſix kinds of *e*'s: the Latins have likewiſe a long and ſhort *e;* they alſo write *e* inſtead of *a*, as *dicem* for *dicam*, &c. and this is no doubt the reaſon why *a* is ſo often changed into *e* in the preter tenſe, as, *ago*, *egi; facio*, *feci*, &c.

As a numeral, E ſtands for 250, according to the verſe,

> E, *quoque ducentos et quinquaginta tenebit.*

In muſic it denotes the tone *e-la-mi.* In the kalendar it is the fifth of the dominical letters. And in ſea-charts it diſtinguiſhes all the eaſterly points: thus, E alone denotes Eaſt; and E. by S. and E. by N. Eaſt by South, and Eaſt by North.

EACHARD (John), an Engliſh divine of great learning and wit in the 17th century, bred at Cambridge, author (in 1670) of *The Grounds and Occaſions of the Contempt of the Clergy and Religion inquired into.* In 1675 he was choſen maſter of Catharine-hall upon the deceaſe of Dr John Lightfoot; and the year following was created D. D. by royal mandate. He died in 1696.

Eachard, Eadmerus. Eachard (Laurence), an eminent Engliſh hiſtorian of the 18th century, nearly related to Dr John Eachard. He was the ſon of a clergyman, who, by the death of his elder brother, became maſter of a good eſtate in Suffolk. He was educated in the univerſity of Cambridge, entered into holy orders, and was preſented to the living of Welton and Elkington in Lincolnſhire, where he ſpent above 20 years of his life, and diſtinguiſhed himſelf by his writings, eſpecially his Hiſtory of England, which was attacked by Dr Edmund Calamy and by Mr John Oldmixon. His "General Eccleſiaſtical Hiſtory from the Nativity of Chriſt to the firſt Eſtabliſhment of Chriſtianity by Human Laws under the emperor Conſtantine the Great," has paſſed through ſeveral editions. He was inſtalled archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EADMERUS, an eſteemed hiſtorian, was an Engliſhman; but his parents, and the particular time and place of his nativity, are not known. He received a learned education, and very early diſcovered a taſte for hiſtory, by recording every remarkable event that came to his knowledge. Being a monk in the cathedral of Canterbury, he had the happineſs to become the boſom-friend and inſeparable companion of two archbiſhops of that ſee, St Anſelm and his ſucceſſor Ralph. To the former of theſe he was appointed ſpiritual director by the Pope; and that prelate would do nothing without his permiſſion. In the year 1120, he was ſent for by king Alexander I. of Scotland, to be raiſed to the primacy of that kingdom; and having obtained leave of king Henry and the archbiſhop of Canterbury, he departed for Scotland, where he was kindly received by the king; and on the third day after his arrival, he was elected biſhop of St Andrew's with much unanimity. But on the day after his election, an unhappy diſpute aroſe between the king and him, in a private conference about his conſecration. Eadmerus having been a conſtant companion of the late and of the preſent archbiſhops of Canterbury, was a violent ſtickler for the prerogatives of that ſee. He therefore told the king, that he was determined to be conſecrated by none but the archbiſhop of Canterbury, who he believed to be the primate of all Britain. Alexander, who was a fierce prince, and ſupported the independency of his crown and kingdom with great ſpirit, was ſo much offended, that he broke off the conference in a violent paſſion, declaring, that the ſee of Canterbury had no pre-eminency over that of St Andrew's. This breach between the king and the biſhop-elect became daily wider, till at length Eadmerus, deſpairing of recovering the royal favour, ſent his paſtoral ring to the king, and laid his paſtoral ſtaff on the high altar, from whence he had taken it, and abandoning his biſhopric returned to England. He was kindly received by the archbiſhop and clergy of Canterbury, though they diſapproved of his ſtiffneſs, and thought him too haſty in forſaking the honourable ſtation to which he had been called. Nor was it long before Eadmerus became ſenſible of his error, and deſirous of correcting it. With this view he wrote a long ſubmiſſive letter to the king of Scotland, intreating his leave to return to his biſhopric, promiſing compliance with his royal pleaſure in every thing reſpecting his conſecration, which was accompanied by an epiſtle to the ſame purpoſe from the archbiſhop. Theſe letters, however, which were written A. D. 1122, did not produce the deſired effect. But Eadmerus is moſt worthy of the grateful remembrance of poſterity for his hiſtorical works, particularly for his excellent hiſtory of the affairs of England in his own time, from A. D. 1066 to A. D. 1122; in which he hath inſerted many original papers, and preſerved many important facts, that are no where elſe to be found. This work hath been highly commended, both by ancient and modern writers, for its authenticity, as well as for regularity of compoſition and purity of ſtyle. It is indeed more free from legendary tales than any other work of this period; and it is impoſſible to peruſe it with attention, without conceiving a favourable opinion of the learning, good ſenſe, ſincerity, and candour of its author.

EAGLE, in ornithology. See FALCO.

EAGLE, in heraldry, is accounted one of the moſt noble bearings in armoury; and, according to the learned in this ſcience, ought to be given to none but ſuch as greatly excel in the virtues of generoſity and courage, or for having done ſingular ſervices to their ſovereigns; in which caſes they may be allowed a whole eagle, or an eagle naiſſant, or only the head or other parts thereof, as may be moſt agreeable to their exploits.

The eagle has been borne, by way of enſign or ſtandard, by ſeveral nations. The firſt who ſeem to have aſſumed the eagle are the Perſians; according to the teſtimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of ſtandards, at length fixed on the eagle, in the ſecond year of the conſulate of C. Marius: till that time, they uſed indifferently wolves, leopards, and eagles, according to the humour of the commander.

The Roman eagles, it muſt be obſerved, were not painted on a cloth or flag; but were figures in relievo, of ſilver or gold, borne on the tops of pikes; the wings being diſplayed, and frequently a thunder-bolt in their talons. Under the eagle on the pike, were piled bucklers, and ſometimes crowns. Thus much we learn from the medals.

Conſtantine is ſaid to have firſt introduced the eagle with two heads, to intimate, that though the empire ſeemed divided, it was yet only one body. Others ſay, that it was Charlemagne who reſumed the eagle as the Roman enſign, and added to it a ſecond head; but that opinion is deſtroyed, by an eagle with two heads, noted by Lipſius, on the Antonine column; as alſo by the eagle's only having one head on the ſeal of the golden bull of the emperor Charles IV. The conjecture, therefore, of F. Meneſtrier appears more probable, who maintains, that as the emperors of the eaſt, when there were two on the throne at the ſame time, ſtruck their coins with the impreſſion of a croſs, with a double traverſe, which each of them held in one hand, as being the ſymbol of the Chriſtians; the like they did with the eagle in their enſigns; and inſtead of doubling their eagles, they joined them together, and repreſented them with two heads. In which they were followed by the emperors of the Weſt.

F. Papebroche wiſhes that this conjecture of Meneſtrier were confirmed by ancient coins; without which, he rather inclines to think the uſe of the eagle with two heads to be merely arbitrary; though he grants it probable, that it was firſt introduced on occaſion of two emperors in the ſame throne.

The eagle on medals, according to M. Spanheim, is a ſymbol of divinity and providence; and, according to all other antiquities, of empire. The princes on whoſe medals it is moſt uſually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word CONSECRATIO, expreſſes the apotheoſis of an emperor.

EAGLES, a name found very frequently in the ancient hiſtories of Ireland, and uſed to expreſs a ſort of baſe money that was current in that kingdom in the firſt years of the reign of Edward I. that is, about the year 1272. There were, beſides the eagles, lionines, roſades, and many other coins of the ſame ſort, named according to the figures they were impreſſed with.

The current coin of the kingdom was at that time a compoſition of copper and ſilver, in a determined proportion, but theſe were ſo much worſe than the ſtandard proportion of that time, that they were not intrinſically worth quite half ſo much as the others. They were imported out of France and other foreign countries. When this prince had been a few years eſtabliſhed on the throne, he ſet up mints in Ireland for the coining ſufficient quantities of good money, and then decried the uſe of theſe eagles, and other the like kinds of baſe coins, and made it death, with confiſcation of effects, to import any more of them into the kingdom.

EAGLE, in aſtronomy, is a conſtellation of the northern hemiſphere, having its right wing contiguous to the equinoctial. See AQUILA.

There are alſo three ſeveral ſtars, particularly denominated among the Arab aſtronomers, *naſr*, i. e. "eagle." The firſt, *naſr ſohail*, the "eagle of canopus," called alſo *ſitareh jemen*, the ſtar of Arabia Felix, over which it is ſuppoſed to preſide; the ſecond, *naſr althair*, the "flying eagle;" and the third, *naſr alvake*, the "reſting eagle."

White EAGLE, is a Poliſh order of knighthood, inſtituted in 1325 by Uladiſlaus V. on marrying his ſon

Caſimire with a daughter of the great-duke of Lithuania.

The knights of this order were diſtinguiſhed by a gold chain, which they wore on the ſtomach, whereon hung a ſilver eagle crowned.

Black Eagle, was a like order, inſtituted in 1701 by the elector of Brandenburgh, on his being crowned king of Pruſſia.

The knights of this order wear an orange-coloured ribbon, to which is ſuſpended a black eagle.

Eagle, in architecture, is a figure of that bird anciently uſed as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples conſecrated to that god.

Eagle-flower. See Balsamine.

Eagle-ſtone, in natural hiſtory, a ſtone, by the Greeks called *ætites*, and by the Italians *pietra d'aquila*, as being ſuppoſed to be ſometimes found in the eagle's neſt. It is of famous traditionary virtue, either for forwarding or preventing the delivery of women in labour, according as it is applied above or below the womb. Matthiolus tells us, that birds of prey could never hatch their young without it, and that they go in ſearch for it as far as the Eaſt Indies. Bauſch has an expreſs Latin treatiſe on the ſubject. See Ætites.

EAGLET, a diminutive of eagle, properly ſignifying a young eagle. In heraldry, when there are ſeveral eagles on the ſame eſcutcheon, they are termed *eaglets*.

EALDERMAN, or Ealdorman, among the Saxons, was of like import with earl among the Danes.

The word was alſo uſed for an elder, ſenator, or ſtateſman. Hence, at this day, we call thoſe *aldermen* who are aſſociates to the chief officer in the common-council of a city or corporate town.

EAR, in anatomy. See there, n° 141.

Several naturaliſts and phyſicians have held, that cutting off the ear rendered perſons barren and unprolific; and this idle notion was what firſt occaſioned the legiſlators to order the ears of thieves, &c. to be cut off, leſt they ſhould produce their like.

The ear has its beauties, which a good painter ought by no means to diſregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius inſiſts, particularly, on the beauties of Auguſtus's ears; and Ælian, deſcribing the beauties of Aſpaſia, obſerves, ſhe had ſhort ears. Martial alſo ranks large ears among the number of deformities.

Among the Athenians, it was a mark of nobility to have the ears bored or perforated. And among the Hebrews and Romans, this was a mark of ſervitude.

Loſs of one ear is a puniſhment enacted by 5 and 6 Edw. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Edw. VI. cap. 15. for combinations to raiſe the price of proviſions, labour, &c. if it be the third offence, beſide pillory, and perpetual infamy, or a fine of 40l.

By a ſtatute of Henry VIII. maliciouſly cutting off the ear of a perſon is made a treſpaſs, for which treble damages ſhall be recovered; and the offender is to pay a fine of ten pounds to the king. 37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is ſaid, that this offence may be puniſhed as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called *Coventry's act*; but ear is not mentioned in that ſtatute.

Ear of Fiſhes. See Comparative *Anatomy*, n° 167.

Ear, in muſic, denotes a kind of internal ſenſe, whereby we perceive and judge of harmony and muſical ſounds. See Music.

In muſic we ſeem univerſally to acknowledge ſomething like a diſtinct ſenſe from the external one of hearing; and call it a *good ear*. And the like diſtinction we ſhould probably acknowledge in other affairs, had we got diſtinct names to denote theſe powers of perception by. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taſte*.

Ear is alſo uſed to ſignify a long cluſter of flowers, or ſeeds, produced by certain plants; uſually called by botaniſts *ſpica*. The flowers and ſeeds of wheat, rye, barley, &c. grow in ears. The ſame holds of the flowers of lavender, &c. We ſay the ſtem of the ear, i. e. its tube or ſtraw; the knot of the ear; the lobes or cells wherein the grains are incloſed; the beard of the ear, &c.

Ear-Ach. See (the *Index* ſubjoined to) Medicine.

Ear-Pick, an inſtrument of ivory, ſilver, or other metal, ſomewhat in form of a probe, for cleanſing the ear. The Chineſe have a variety of theſe inſtruments, with which they are mighty fond of tickling their ears; but this practice, Sir Hans Sloane obſerves, muſt be very prejudicial to ſo delicate an organ, by bringing too great a flow of humours on it.

Ear-Ring. See Pendent.

Ear-Wax. See Cerumen, and Anatomy, p. 764, col. 1.

EARWIG, in zoology. See Forficula.

EARING, in the ſea-language, is that part of the bolt-rope which at the four corners of the ſail is left open, in the ſhape of a ring. The two uppermoſt parts are put over the ends of the yard-arms, and ſo the ſail is made faſt to the yard; and into the lowermoſt earings, the ſheets and tacks are ſeized or bent at the clew.

EARL, a Britiſh title of nobility, next below a marquis, and above a viſcount.

The title is ſo ancient, that its original cannot be clearly traced out. This much, however, ſeems tolerably certain, that among the Saxons they were called *ealdormen*, *quaſi* elder men, ſignifying the ſame with *ſenior* or *ſenator* among the Romans; and alſo *ſchiremen*, becauſe they had each of them the civil government of a ſeveral diviſion or ſhire. On the irruption of the Danes they changed their names to *eorels*, which, according to Camden, ſignified the ſame in their language. In Latin they are called *comites* (a title firſt uſed in the empire), from being the king's attendants; *a ſocietate nomen ſumpſerunt, regis enim tales ſibi aſſociant.* After the Norman conqueſt they were for ſome time called *counts*, or *countees*, from the French; but they did not long retain that name themſelves, though their ſhires are from thence called *counties* to this day. It is now become a mere title: they have nothing to do with the government of the county; which is now entirely devolved on the ſheriff, the earl's deputy, or *vice-comes*. In writs, commiſſions, and other formal inſtruments, the king, when he mentions any peer of the degree of an earl, uſually ſtyles him "truſty and well-beloved *couſin*:" an appellation as ancient as the reign of Henry IV.; who being either by his wife, his mother, or his ſiſters, actually related or allied to every earl in the kingdom, artfully and conſtantly acknowledged that connection in all his letters and other public acts; whence the uſage has deſcended to his ſucceſſors, though the reaſon has long ago failed.

An earl is created by cincture of ſword, mantle of ſtate put upon him by the king himſelf, a cap and a coronet put upon his head, and a charter in his hand.

Earl-Marſhal. See Marshal.

EARNEST (ARRHÆ), money advanced to bind the parties to the performance of a verbal bargain. By the civil law, he who recedes from his bargain loſes his earneſt, and if the perſon who received the earneſt give back, he is to return the earneſt double. But with us, the perſon who gave it, is in ſtrictneſs obliged to abide by his bargain; and in caſe he decline it, is not diſcharged upon forfeiting his earneſt, but may be ſued for the whole money ſtipulated.

EARTH, among ancient philoſophers, one of the four elements of which the whole ſyſtem of nature was thought to be compoſed. See Element.

Earths, in chemiſtry, are defined by Cronſtedt to be ſuch ſubſtances as are not ductile, moſtly indiſſoluble in water or oil, and that preſerve their conſtitution in a ſtrong heat. Mr Bergman remarks that they are inſipid, and not ſoluble in 1000 times their weight of boiling water; though, by augmenting the heat as in Papin's digeſter, perhaps all the kinds we are yet acquainted with may be found capable of ſolution, eſpecially when precipitated from ſome other menſtruum; their ſurface being then greatly augmented. In the chain of nature they proceed by an inſenſible gradation towards the ſalts, ſo that they cannot be ſeparated but by artificial limits. A moderate heat does not change their form, nor are they diſſipated by a more violent one. Dr Black defines them to be ſuch bodies as are not ſoluble in water, not inflammable, and their ſpecific gravity not more than four times the weight of water. They are diſtinguiſhed from the ſalts by their inſolubility; from the inflammables, by their want of inflammability; and from the metals, by their deficiency in weight. Some objections have been made to this definition, as not being ſtrictly applicable to thoſe earths which are known to be ſoluble in water: but this objection may be accounted of little weight, when we conſider the extreme diſparity betwixt the ſolubility of the earths and ſalts, a few grains of the earths ſaturating ſome pounds of water; ſo that if they have any ſolubility, they muſt be allowed to poſſeſs but a very ſmall ſhare of it.

Another property, which is not uſually taken into the definition, makes nevertheleſs a remarkable part of the character of earthy bodies, viz. their great fixedneſs in the fire. All the other claſſes of bodies ſhow themſelves volatile in more or leſs violent degrees of heat. All the ſalts can be made to evaporate; all the inflammable ſubſtances are volatile; all the metals, gold not excepted, have been converted into vapour; but the earths, as far as we know, have never been volatilized, excepting only two, the diamond and aſbeſtos. Some phenomena attending the volatilization of the diamond give reaſon to ſuſpect that it is not a pure earthy ſubſtance. There is an appearance of inflammation; and it ſeems to be a compound, having an earthy matter for its baſis, and deriving its volatility from other matters. In general therefore, the earths have been found fixed in any degree of heat of which we have had experience; though there is no doubt a poſſibility, that heat might be raiſed to ſuch an intenſity as to volatilize the moſt fixed body in nature; but till the means of doing ſo ſhall be found out, the earths may be conſidered as abſolutely fixed.

The earths called *primitive* or *ſimple*, becauſe they cannot be decompoſed by any method hitherto known, were by Cronſtedt ſuppoſed to be nine; but later chemiſts have reduced them to five. Some reduce the number ſtill farther; but Mr Bergman informs us that theſe "reſt their opinions upon fanciful metamorphoſes unſupported by faithful experiments. As experiments teach us that there are five primitive earths, it is evident that the ſpecies ariſing from their mixture cannot exceed 24, viz. ten double, conſiſting of two earths; ſix triple, three quadruple, and the five primitive earths. Even all theſe different mixtures have not been found, though they probably do exiſt in nature. The natural compoſitions of acids with the earths, forming ſubſtances not ſoluble in 1000 times their weight of boiling water, and which may be called *ſaline earths*, are undoubtedly chemical combinations. The five primitive earths are, terra ponderoſa; calx or calcareous earth, capable of being reduced into quicklime; magneſia; argilla or argillaceous earth; and ſiliceous earths.

"But though we muſt conſider theſe as the moſt pure of all the earthy bodies, they are never found native in a ſtate of abſolute purity; nor indeed can they be made perfectly pure even by artificial means. Water and aerial acid unite readily with the four firſt; and when expelled by fire, a little of the matter of heat is added, until driven out by a more powerful attraction. But in this ſtate they poſſeſs a degree of purity not to be attained by any other known method. Therefore it is neceſſary to examine them when ſufficiently burnt, in order to diſtinguiſh better what properties depend upon adhering heterogeneous matters."

Our author at firſt added the earth of gems to the five claſſes already mentioned; but he found afterwards that all kinds of gems are compounded of ſome of the five kinds already mentioned, particularly of the argillaceous kind, inſomuch that they may be ſaid almoſt entirely to belong to this claſs. Still, however, the earth of diamonds ſeems to poſſeſs properties eſſentially diſtinct from the five already mentioned, and therefore may not unjuſtly be reckoned a ſixth claſs, though its characters have as yet been but very imperfectly examined.

I. *Terra Ponderoſa*. This was diſcovered in Sweden about the year 1774, and is found in ſeveral different forms.

1. Combined with aerial acid, called by Dr Withering *terra ponderoſa aerata*. This ſubſtance has been

met with in England; and an account of it, with Dr Withering's analyſis, is given under the article CHEMISTRY.

2. The ſpar-like gypſum, marmor metallicum, lapis bononienſis, phoſphorus nativus, baro-ſelenite, &c. is of very conſiderable ſpecific gravity, approaching to that of tin or iron; on which account it has been ſuppoſed to contain ſomething metallic. But no experiments hitherto made have evinced the exiſtence of any metal in it, excepting a few traces of iron, which are to be met with in all the gypſa. It is met with of two kinds, ſemitranſparent and opaque; the latter being either of a white or reddiſh colour. The ſpecific gravity is about 4,500, water being accounted 1000. It contains about 84 parts of ponderous earth, 13 of the moſt concentrated vitriolic acid, and three of water. The method of preparing the phoſphorus from this ſubſtance is mentioned under the article CHEMISTRY; but Cronſtedt obſerves, that the phoſphoreſcent quality of theſe ſtones is different from that of the ſparry fluors and limeſtones, which is only produced by their being ſlowly heated, and ſeems to ariſe from a phlogiſton which is deſtroyed by a glowing heat. M. Scheffer, in the Stockholm Memoirs for 1753, relates ſome experiments on a ſtone of this kind from China, which ſhow that it is exactly the ſame with the *petunſe* of that country, an ingredient in their porcelain manufactories. This ſtone does not burn into plaſter as gypſum does, and is infuſible by itſelf. It frequently contains calcareous earth, and ſometimes is met with in the ores of metals, and it likewiſe forms the baſis of ſome petrifications. Sometimes it contains one or two parts of iron in the hundred.

3. The marmor metallicum druſicum, or ponderous druſen ſpar, is found in the lead-mines at Alſtonmoor in Cumberland, regularly cryſtallized in the form of alum, ſolid, and ſemitranſparent. M. Magellan ſays that he was ſhowed ſome fine ſpecimens of this mineral by a Mr Thomſon, who informed him that "it ſeems to affect the peculiarity of having its cryſtals laminated, as radiating from a centre; but that this radiation ſeldom amounts to a whole circle. The corners of theſe flat cryſtals are truncated like thoſe of alum, and thicker on one ſide than the other of the parallelogram, in ſuch a manner as to fit one another in the kind of arched vault which they form together, and have ſome ſmall ones adhering to their ſides like druſen ſpars, having internal angles, as the *macles* of the French, or the cruciform cryſtallizations." The ſpecific gravity of theſe cryſtals were found by Mr Nicholſon, with an inſtrument of his own invention, to be to water as 44,745 to 10,000. This ſpecies of cryſtals is found in Auvergne in France, and has been deſcribed by Mr Bayen, who ſuppoſed its baſis to be calcareous. It was extremely refractory, and the ſurface of its cryſtals covered with ferruginous ochre. A variety of this is found jagged like cocks combs. This is met with in clifts and fiſſures, accreted on the ſurfaces of balls of the ſame ſubſtance. In Derbyſhire this ſubſtance is called *cauk* or *calk*. M. Magellan was ſhowed ſome ſpecimens of it by Mr Whitehurſt, which had not only convex but flat ſurfaces. Thoſe of the upper aggregated parts were rather like the edges of very thin flattiſh lenſes put together, than like cocks combs. Varieties of it are alſo found of white and reddiſh colours. It is likewiſe met with of a fibrous texture in the form of zeolite or aſbeſtos in filaments. M. Monnet is of opinion that theſe ſpars ſometimes contain phlogiſton, having obſerved that they become a liver of ſulphur in a ſtrong heat; but Mr Woulfe is of opinion that this gentleman was deceived by charcoal falling into his crucible.

4. The lapis hepaticus, or leberſtein of the Germans and Swedes. Some ſpecimens of this ſtone conſtantly ſmell like liver of ſulphur, but others only when rubbed. It does not efferveſce with acids, and according to M. Magellan is a medium between the gypſum and fetid calcareous ſtones with which it has generally been confounded; but it will not yield any lime, though the latter are more fit for the purpoſe than any other. Mr Kirwan informs us that this ſtone is generally compact, but not hard enough to ſtrike fire; its texture is either equable or laminar, ſcaly or ſparry; and it takes a poliſh like alabaſter, does not efferveſce with acids, and when calcined is partially reduced to a kind of plaſter of Paris. According to the analyſis of this ſtone given us by Profeſſor Bergman, 100 parts of it contain 33 of baro-ſelenite, 38 of ſiliceous earth, 22 of alum, ſeven of gypſum, and five of mineral oil. Cronſtedt denies that theſe ſtones contain any volatile alkali, though his aſſertion is contradicted by Wallerius, who affirms, that a volatile alkali certainly exiſts in them, and may be diſcovered by a chemical analyſis. "The method which nature takes to combine the ingredients of the lapis hepaticus (ſays Cronſtedt), may be perhaps the ſame as when a limeſtone is laid in an heap of mundic while it is roaſting; becauſe there the ſulphur unites itſelf with the limeſtone, whereby the latter acquires the ſmell of liver of ſulphur, inſtead of which the vitriolic acid alone enters the compoſition of gypſum. How the ſulphur combines itſelf may likewiſe be obſerved in the ſlate-balls or kernels from the Andrarum alum mines to be afterwards mentioned, where it ſometimes combines with a martial earth with which this ſlate abounds, and with it forms pyrites within the very ſlate-balls. The fetid or ſwine ſtones, as well as the liver-ſtones, are, with regard to the ſtructure of their parts, ſubject to the ſame varieties with the other kinds of limeſtones." This kind of ſtone is found, 1. Scaly, of which there are two varieties; one having coarſe ſcales, the other of a whitiſh yellow colour. 2. With fine glittering ſcales. This is met with of a black colour at Andrarum in Sweden, in the alum ſlate above mentioned. Bergman ſays that this kind conſiſts of a ponderous earth combined with vitriolic acid, mixed with a rock oil, and with the calcareous, argillaceous, and ſiliceous earths. He adds, that by a chemical analyſis one of theſe kernels gave 29 parts of cauſtic ponderous earth, 33 of ſiliceous, almoſt 5 of the argillaceous, and 3.7 of lime, beſides the water and vitriolic acid which entered its compoſition.

II. *Calcareous Earths*, when freed from impurities as far as poſſible, have the following properties. 1. They become friable when burnt in the fire. 2. They more readily fall into powder by being thrown into water, or having it thrown upon them after calcination. 3. They cannot be melted by themſelves into glaſs in cloſe veſſels. 4. They augment the cauſticity of alkaline ſalts by being mixed with them after burning. 5. They exhibit different phenomena in combination with the different acids. With the vitriolic they precipitate in the form of a gypſeous earth capable of ſhooting, by proper management, into ſelenitic cryſtals. With marine acid they form a deliqueſcent maſs called *fixed ſal ammoniac*, and which forms a kind of phoſphorus. With nitrous acid they combine into a glutinous deliqueſcent maſs, from which the acid may be partly driven off by fire; in which operation part of the earth itſelf is volatilized, and which, in a certain ſtate of calcination, produces Baldwin's phoſphorus. With the fluor acid they regenerate the ſpar from which this acid was procured. With phoſphoric acid they are ſaid to regenerate the earth of bones; though the experiments by which this is ſaid to be proved are, as we have often had occaſion to obſerve, by no means concluſive. With the acid of vinegar they cryſtallize into neutral ſalts, which do not deliqueſce in the air. 6. With borax they readily melt into a kind of glaſs which takes impreſſions in a degree of heat below ignition. 7. With the microcoſmic acid they likewiſe melt into glaſs with efferveſcence; a circumſtance likewiſe obſervable when borax is made uſe of; and both theſe glaſſes are quite colourleſs and tranſparent while hot, but become opaque as ſoon as they cool; but if the bead is thrown whilſt hot into melted tallow, or even into warm water or any other hot liquor, it preſerves its tranſparency. 8. With fluſs-ſpat they melt more readily than with any other into a kind of ſlag, by which crucibles are corroded. This, however, according to M. Magellan, is entirely to be attributed to the ſolvents. 9. In certain caſes they are likewiſe found capable of reducing ſome metallic calces, as thoſe of lead and biſmuth; ſometimes alſo thoſe of iron and copper are affected, though in a leſs degree. But on this Mr Kirwan remarks, that ſuch reductions take place only when the earth is combined with aerial acid; and that though calces of lead are in ſome meaſure reduced by chalk, they are not in the leaſt affected by lime; which evidently proves that they receive phlogiſton from fixed air, which is a compound of phlogiſton and dephlogiſticated air. 10. In this laſt inſtance, as well as in ſome others, they reſemble alkaline ſalts; whence they frequently take the title of alkaline earths. Mr Bergman obſerves, that as calcareous earth united to the aerial acid is found native, very little trouble is neceſſary to procure it in a ſtate of purity. For this purpoſe nothing more is requiſite than to boil ſelected pieces of chalk repeatedly in pure water, which diſſolves any calcined earth or *magneſia ſalita* that may be contained in it; after which operation it has no heterogeneous matter but what mechanically adheres to it, the quantity of which is generally extremely ſmall; and if we likewiſe deſire to have it abſolutely free of this, we muſt diſſolve it in vinegar, precipitate it with mild volatile alkali, and dry it after carefully waſhing the precipitate. The ſpecific gravity of the precipitate thus carefully waſhed and dried is about 2.720. An hundred parts of it contain about 34 of aerial acid, 11 of water, and 54 of pure earth. Acids unite with it with efferveſcence, and the mixture produces heat. When burnt it loſes $\frac{45}{100}$ of its weight; and in this ſtate diſſolves in 700 times its weight of water, producing heat at the ſame time. If acids are poured upon it when in a calcined ſtate, a great degree of heat is produced; inſomuch that unleſs part of it be abſtracted by previouſly mixing the earth with water, the mixture will be made to boil. The pouring of water upon calcined earth of this kind likewiſe expels the atmoſpheric air from its pores. In this caſe, if nitrous or muriatic acid be added, no efferveſcence will enſue; the ſolution will proceed ſlowly, but the ſaturation becomes at length as perfect as if the earth had not been calcined. By this burnt earth the acid is expelled from ſal ammoniac, ſulphur is diſſolved, and other remarkable effects performed, of which an account is given under the articles Chemistry, Dyeing, Cement, Mortar, &c.

The calcareous earth, according to Cronſtedt, is common to all the three kingdoms of nature; exiſting in the ſhells and bones of animals, the aſhes of vegetables; and conſequently, ſays he, it muſt have exiſted before any living or vegetable ſubſtance, and is no doubt diſtributed throughout the earth in a quantity proportioned to its general uſe.

The forms in which calcareous earth is ever met with are the ſhells of animals, chalk, limeſtone, and marble; for an account of which ſee theſe different articles. Its uſes as a manure, and in building, are detailed under the articles Cement and Agriculture. Meſſrs Sage, Rome de L'Iſle, &c. have ſuppoſed the exiſtence of a kind of earth called *abſorbent*, diſtinct from the calcareous; but M. Monnet has ſhown this to be truly calcareous.

III. *Magneſia*, called alſo *terra muriatica*, or magneſia alba. The nature and properties of this earth are deſcribed under the article Magnesia. It is found,

1. Combined with the vitriolic acid in the form of a bitter ſalt called Epſom or Sedlitz ſalt. This is found in great plenty in the liquor which remains after the cryſtallization of ſea-ſalt.

2. With the marine acid; in which caſe it forms a ſalt likewiſe cryſtallizable, but of a very hot burning taſte, and emitting vapours of ſpirit of ſalt by diſtillation. This is known by the name of *magneſia ſalita*, and is likewiſe found in plenty in the liquor above mentioned.

3. It is contained alſo in freſh waters, where it is diſſolved by the aerial acid.

4. Combined with the ſiliceous earth. This is commonly unctuous to the touch, and of different degrees of hardneſs, incapable of being diffuſed in water, and growing hard and very refractory in the fire. It is met with in various parts of the world, particularly in the eaſt, and is the ſubſtance of which the large Turky tobacco-pipes are made. It is alſo called *French chalk*, and is met with in England about the Land's End of Cornwall, of a yellow colour, or red and white like Caſtile ſoap. It conſiſts, according to Mr Wiegleb, of equal parts of magneſia and ſiliceous earth. A mixture of this with calcareous earth and iron is found near Thionville in the French part of Luxembourg. It is of a blue colour, and contains the greateſt proportion of calcareous earth, with ſome clay and petrified matters. Another of an olive colour is found in the ſame place; but has no argillaceous earth in it, though they

both look like clay, and the laſt is uſed in pottery. A mixture of this earth with clay, talc, and iron, is found in Sileſia. It is of a greeniſh yellow, is of a looſe form and greaſy feel. According to Mr Margraaff it contains one-third of magneſia.

5. In ſteatites or ſoap-rock. See Steatites.

6. In ſerpentine ſtone. See Serpentine.

IV. *Argillaceous Earths.* See Clay.

V. *Siliceous Earths.* See Chemistry, Flint, Gems, Diamond, Emerald, Sapphire, &c. alſo Chemistry, n° 829, 847, 1074, and 1076.

Earth, in aſtronomy and geography, one of the primary planets; being this terraqueous globe which we inhabit.

The coſmogony, or knowledge of the original formation of the earth, the materials of which it was compoſed, and by what means they were diſpoſed in the order in which we ſee them at preſent, is a ſubject which, though perhaps above the reach of human ſagacity, has exerciſed the wit of philoſophers in all ages. To recount the opinions of all the eminent philoſophers of antiquity upon this ſubject would be very tedious: it may therefore ſuffice to obſerve, that, ever ſince the ſubject began to be canvaſſed, the opinions of thoſe who have treated it may be divided into two claſſes. 1. Thoſe who believed the earth and whole viſible ſyſtem of nature to be the Deity himſelf, or connected with him in the ſame manner that a human body is with its ſoul. 2. Thoſe who believed the materials of it to have been eternal, but diſtinct from the Deity, and put into the preſent order by ſome power either inherent in themſelves or belonging to the Deity. Of the former opinion were Zenophanes the founder of the *eleatic* ſect, Strato of Lampſacus, the Peripatetics, &c.

1
Different opinions reſpecting the coſmogony.

The ſecond opinion, namely, that the ſubſtance of the earth or univerſe (for it is impoſſible to ſpeak of the one without the other) was eternal, though not the form, was moſt generally held among the ancients. From that eſtabliſhed axiom, that "nothing can be produced from nothing," they concluded that creation was an impoſſibility; but at the ſame time they thought they had good reaſon to believe the world had not been always in its preſent form. They who held this opinion may again be divided into two claſſes: firſt, thoſe who endeavoured to account for the generation of the world, or its reduction into the preſent form, by principles merely mechanical, without having recourſe to any aſſiſtance from divine power; and, ſecondly, thoſe who introduced an intelligent mind as the author and diſpoſer of all things. To the firſt of theſe claſſes belonged the coſmogony of the Babylonians, Phœnicians, and Egyptians; the particulars of which are too abſurd to deſerve notice. Of the ſame opinion alſo were moſt of the poets; the philoſophers Thales, Anaximander, Anaximenes, Anaxagoras, &c. The latter attempted to reform the philoſophy of his maſter Anaximenes by introducing an intelligent principle into the world diſtinct from matter; thus making his intelligent principle, or God, the ſoul of the world. Diogenes of Apollonia ſuppoſed air, which he made the firſt principle of all things, to be endued with reaſon: His manner of philoſophiſing differed very little from that of Des Cartes. "All things (ſays he) being in motion, ſome became condenſed and others rarefied. In thoſe places where condenſation prevailed, a whirling motion or vortex was formed; which by its revolution drew in the reſt, and the lighter parts flying upwards formed the ſun."

2
Syſtems of Democritus and Epicurus.

The moſt remarkable of the atheiſtic ſyſtems, however, was the atomic one, ſuppoſed to have been invented by Democritus; though Laertius attributes it to Leucippus, and ſome make it much older. According to this ſyſtem, the firſt principles of all things were an infinite multitude of atoms, or indiviſible particles of different ſizes and figures; which, moving fortuitouſly, or without deſign, from all eternity, in infinite ſpace, and encountering with one another, became variouſly entangled during their conflict. This firſt produced a confuſed chaos of all kinds of particles; which afterwards, by continual agitation, ſtriking and repelling each other, diſpoſed themſelves into a vortex or vortices, where, after innumerable revolutions and motions in all poſſible directions, they at laſt ſettled into their preſent order.

The hypotheſis of Democritus agrees in the main with that of Epicurus as repreſented by Lucretius; excepting that no mention is made of thoſe vortices, which yet were an eſſential part of the former. To the two properties of magnitude and figure which Democritus attributed to his atoms, Epicurus added a third, namely, weight; and, without this, he did not imagine they could move at all. The ſyſtem of Democritus neceſſarily introduced abſolute fatal neceſſity; which Epicurus not chooſing to agree to, he invented a third motion of the atoms, unknown to thoſe who had gone before him. His predeceſſors allowed them to have a perpendicular and reflexive motion: but Epicurus, though he allowed theſe motions to be abſolutely neceſſary and unavoidable, aſſerted that the atoms could alſo of themſelves decline from the right line: and from this declination of the atoms he explained the free will of man.—The moſt material difference between the two ſyſtems, however, was, that Epicurus admitted no principle but the atoms themſelves; whereas Democritus believed them to be animated.

3
Of Pythagoras, Plato, and Ariſtotle.

Of thoſe who held two diſtinct and coeternal principles, *viz.* God and Matter, we ſhall only take notice of the opinions of Pythagoras, Plato, and Ariſtotle, as being the moſt remarkable.

Pythagoras is ſaid to have aſſerted two ſubſtantial ſelf-exiſtent principles: a *monad*, or unity; and a *dyad*, or duality. The meaning of theſe terms is now ſomewhat uncertain. Some think, that by the monad he meant the Deity, and by the dyad matter. Others think, that the Pythagoric monads were atoms. The dyad is ſometimes thought to ſignify a demon or evil principle; but Porphyry's interpretation, which ſeems the moſt probable, is as follows. The cauſe, ſays he, of that ſympathy, harmony, and agreement which is in things, and of the conſervation of the whole, which is always the ſame and like itſelf, was by Pythagoras called *unity;* that unity which is in the things themſelves being but a participation of the firſt cauſe: but the reaſon of difference, inequality, and conſtant irregularity in things, was by him called a *dyad.* This philoſopher held *numbers* to be the principles

ciples of all things; and from them he accounted for the production of the world in the following manner. He ſuppoſed that the monad and dyad were the two ſources of numbers, from whence proceeded points; from points, lines; from lines, plane figures; from planes, ſolids: from ſolids, ſenſible bodies. The elements of ſenſible bodies are four; but, beſides theſe, there was a fifth (never yet diſcovered). The four elements which manifeſt themſelves to our ſenſes are, fire, air, earth, and water. Theſe are in a perpetual change, and from them the world was formed; which is animated, intelligent, and ſpherical; containing, in the midſt of it, the earth, a globoſe and inhabited body. The world, he ſaid, began from fire and the fifth element; and that as there were five figures of ſolid bodies, called mathematical or regular, the earth was made of the cube, fire of the pyramid or tetrahedron, the air of the octahedron, water of the icoſahedron, and the ſphere of the univerſe of the dodecahedron.—This method of philoſophizing, which has no manner of foundation in nature, was adopted by Plato and Ariſtotle; and hence proceeded all the abſurdities concerning ideas, forms, qualities, &c. with which the Ariſtotelian philoſophy was loaded.

4
Newtonian ſyſtem ſuperſedes the Ariſtotelian and Carteſian.

5
Three laws of nature laid down by Sir Iſaac.

For a long time, however, the philoſophy of Ariſtotle prevailed, and the world was thought to be upheld by forms, qualities, and other unintelligible and imaginary beings.—At laſt the French philoſopher Des Cartes ſuperſeded the Ariſtotelian, by introducing the atomic or Democritic, and Epicurean philoſophy *. The Carteſian ſyſtem was quickly ſuperſeded by the Newtonian; which ſtill continues, though conſiderably different from what it was left by that great man.—His opinions, indeed, concerning the coſmogony ſeem to have been in a fluctuating ſtate; and hence he delivers himſelf in ſuch a manner, that he hath often incurred the charge of contradicting himſelf.—He maintained, for inſtance, that matter was infinitely diviſible; and the mathematical demonſtrations of this propoſition are well known. Notwithſtanding this, however, when he comes particularly to ſpeak of the original conſtruction of the world, he ſeems to retract this opinion, and adopt the atomic philoſophy. He tells us, that it ſeems probable, that in the beginning God formed matter in *ſolid, maſſy, impenetrable* particles, &c. †; and that of theſe particles, endowed with various powers of attraction and repulſion, the preſent ſyſtem of nature is formed. His primary laws of nature are only three in number, and very ſimple. The firſt is, that all matter has a tendency to continue in that ſtate in which it is once placed, whether of reſt or motion. If it is at reſt, for example, it will continue at reſt for ever, without beginning motion of itſelf; but if it is once ſet in motion by any cauſe whatever, it will for ever continue to move in a right line, until ſomething either ſtops it altogether, or forces it to move in another direction. 2. That the change of motion is always equivalent to the moving force employed to produce it, and in the direction of the right line in which it is impreſſed; that is, if a certain force produces a certain motion, double that force will produce double that motion, &c. 3. Reaction is always contrary and equal to action; or the actions of two bodies upon one another are always equal and contrary to one another.

6
Diſagreement among his followers.

7
Mr Mitchel, Boſcovich, and Dr Prieſtley's opinions.

From theſe three laws, together with the two contrary forces of attraction and repulſion, Sir Iſaac Newton and his followers have attempted to explain all the phenomena of nature. When they come to explain the nature of the attractive and repulſive forces, however, they are exceedingly embarraſſed. Sir Iſaac hath expreſſed himſelf in two different ways concerning them. In his Principia, he pretty poſitively determines them to be owing to a cauſe that is not material; and in his Queries, he ſuppoſes they may be effects of ſome ſubtile matter which he calls *ether*. This diſagreement with himſelf hath produced no ſmall diſagreement among his followers. One party, laying hold of his aſſertions in the Principia, determine the world to be upheld by *immaterial* powers; while the other, neglecting the Principia, and taking notice only of the Queries at the end of the Optics, ſtrenuouſly maintain, that attraction and repulſion are owing to the action of ſome exceedingly fine and ſubtile ether.—The firſt of theſe ſuppoſitions, it is argued, neceſſarily involves us in one of the following dilemmas. 1. If the attractive and repulſive forces are not material, they muſt either be occaſioned by ſpiritual beings, or they muſt be *qualities* of matter. If they are occaſioned by the action of immaterial beings, theſe beings muſt either be created or uncreated. If they are produced by the action of created beings, we run into the ſuppoſition of ſome of the ancient heathens, that the world is governed by demons or ſubordinate intelligences; and thus may make an eaſy tranſition to polytheiſm. If attraction and repulſion are the immediate action of the Deity himſelf, we run into the doctrine of making God the ſoul of the world.—This laſt hypotheſis hath been moſt ſtrenuouſly adopted by Mr Baxter in his treatiſe of the Immateriality of the human Soul. Mr Boſcovich, Mr Mitchel, and Dr Prieſtley, have likewiſe adopted the hypotheſis of immaterial powers to ſuch a degree, that, according to them, the whole world conſiſts of nothing elſe but *attractions* and *repulſions* ſurrounding *phyſical points* †. 2. If we ſuppoſe the attractive and repulſive powers to be only *properties*, *qualities*, or *laws*, impreſſed on matter by the Deity, we might as well have been contented with the occult qualities of Ariſtotle.—If attraction and repulſion are occaſioned by the action of mere matter, and all the powers in nature are only material, the charge is incurred of making nature direct itſelf in ſuch a manner, that there is no occaſion for the interpoſition, or even the exiſtence, of a Deity at all.

8
Mr Hutchinſon's ſyſtem.

Thus we ſee, the Newtonian coſmogony muſt incline either to the Platonic and Ariſtotelian, or to the Atomic or Epicurean; according to the hypotheſis we lay down concerning the nature of attraction. Des Cartes's ſyſtem was plainly a revival of that of Democritus and Epicurus, with ſome corrections and improvements. It was farther improved and corrected by Mr Hutchinſon, who added to it the authority of Revelation. The created agents he choſe in his coſmogony were fire, light, and air. Theſe, we ſee, have indeed a very conſiderable ſhare in the operations of nature; but unleſs we explain the manner in which they operate, our knowledge is not at all increaſed, and we might as well have been contented with the Newtonian attraction and repulſion, or even the occult qualities of Ariſtotle. Attempts have indeed been made to ſolve the phenomena of nature, from the action of theſe three agents, both by Hutchinſon himſelf and many of his followers.—Theſe attempts, however, have always proved unſucceſsful. Some phenomena indeed may be explained pretty plauſibly from the known action of theſe three; but when we come to ſpeak of what may be called the *nicer operations* of nature, ſuch as the growth of plants and animals, we are utterly at a loſs.

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* See *Aſtronomy*, n° 252.

† See *Coheſion*, n° 2.

† See *Coheſion*, n° 8.

9
A deficiency of active principles in all the theories yet invented.

The manifeſt deficiency of active principles in all the theories of the earth that have yet been invented, hath occaſioned a conſtant ſearch after others which ſhould be able, by their ſuperior activity, to fill up the blank which neceſſarily remained in the ſyſtem.—Pythagoras, Plato, and Ariſtotle, being unable to account for the formation of the earth from their four elements, called in the aſſiſtance of a *fifth*, which was never yet diſcovered. Epicurus, finding the motions attributed to his atoms by Democritus to be inſufficient, had recourſe to an imaginary, and on his own principles *impoſſible*, declination of the atoms. Des Cartes, finding the atoms themſelves inſufficient, aſſerted that they were not atoms, but might be broken into ſmaller parts, and thus conſtitute matter of various degrees of ſubtility. The Newtonian philoſophers have found Des Cartes's ſyſtem inſufficient; but being greatly diſtreſſed in their attempts to ſolve all the phenomena of nature by mere attraction and repulſion, have been obliged to call in the action of *mind* to their aſſiſtance. The Hutchinſonians were hardly put to it in accounting for every thing by the action of fire, light, and air, when luckily the diſcoveries in electricity came to their aſſiſtance. It muſt be owned, that this fluid does indeed come in like a kind of fifth element, which in many caſes appears to be the animating principle of nature. For ſome time paſt, almoſt all the remarkable phenomena in nature have been explained by electricity, or the action of the electric fluid. But unleſs this action is explained, we are got no farther than we were before. To ſay that any thing is done by electricity, is not more intelligible than to ſay that it was done by attraction. If we explain an effect by a material cauſe, it ought to be done upon mechanical principles. We ought to be ſenſible how one part of matter acts upon another part in ſuch a manner as to produce the effect we deſire to explain. The electrical philoſophers, however, have not yet been able to inveſtigate the manner in which this ſubtile fluid operates; and hence the many diſcoveries in electricity have not contributed to throw that light on the theory of the earth, which perhaps they may do hereafter. With ſome philoſophers, however, the electric fluid itſelf, and indeed all the powers of nature, were in danger of being ſuperſeded by a principle, lately very little known, called the *phlogiſton*.—Thus, Mr Henly tells us*, that Mr Clarke, an ingenious gentleman in Ireland, hath diſcovered all the different kinds of air produced from metals, &c. by Dr Prieſtley, to be only *phlogiſtic vapours* ariſing from theſe ſubſtances. Dr Prieſtley himſelf ſuppoſes, that the electric light is a modification of *phlogiſton*; and conſequently thinks it probable, that all light is a modification of the ſame. Fire or flame is thought to be a chemical combination of air with the phlogiſton; and phlogiſton is thought to give the elaſticity to air, and every other elaſtic fluid, &c. Another party, ſeemingly jealous of the powers of this new principle, have denied its exiſtence altogether, and in its ſtead introduced another equally inſufficient, called the *oxygenous principle*. Others have reduced all nature to the two principles called *principium ſorbile* and *principium proprium*. All theſe, however, are ſhown, in other parts of this work, to be mere inactive ſubſtances; the phlogiſton, common charcoal; the oxygenous principle, water deprived of the quantity of phlogiſton it uſually contains; the principium ſorbile, the ſame; and the principium proprium, a name for the particular modification of the *atoms*, or what we pleaſe to call the inviſible eſſence of matter which diſtinguiſhes one body from another, and which muſt be for ever unknown to all human creatures.—Be this as it will, the late diſcoveries in electricity have tended very much to change the form of the Newtonian philoſophy, and to introduce that *materialiſm* into our theories of the natural phenomena which is by ſome people ſo much complained of.

10
Little progreſs as yet made in true philoſophy.

From this general hiſtory of the different agents which philoſophers have choſen to account for the original formation of the earth, and for its preſervation in the preſent form, it appears, that ſcarce any advance in true knowledge hath yet been made. All the agents have been prodigiouſly defective; electricity itſelf, as far as yet known, not excepted. But before we enter into a particular conſideration of thoſe theories which ſeem moſt worthy of notice, it will be neceſſary to point out the principal difficulties which ſtand in the way of one who attempts to give a complete theory of the earth.

11
Difficulties which occur in forming a theory of the earth.

1. The earth, although pretty much of a ſpherical figure, is not completely ſo; but protuberates conſiderably about the equatorial parts, and is proportionably flattened at the poles, as is undeniably proved by the obſervations of modern mathematicians†. The queſtion here is, Why the natural cauſe which gave the earth ſo much of a ſpherical figure, did not make it a complete and exact ſphere?

2. The terraqueous globe conſiſts of a vaſt quantity of water as well as dry land. In many places, ſuch as the Iſthmus of Darien, a narrow neck of land is interpoſed betwixt two vaſt oceans. Theſe beat upon it on either ſide with vaſt force; yet the Iſthmus is never broke down nor diminiſhed. The caſe is the ſame with the Iſthmus of Suez which joins Aſia and Africa, and with that which joins the Morea or ancient Peloponneſus to the continent. The difficulty is, By what natural power or law are theſe narrow necks of land preſerved amidſt the waters which threaten them on both ſides with deſtruction?

3. The ſurface of the earth is by no means ſmooth and equal; but in ſome places raiſed into enormous ridges of mountains, and in others ſunk down in ſuch a manner as to form deep valleys. Theſe mountains, though they have been expoſed to all the injuries of the weather for many thouſand years, exhibit no ſigns of decay. They ſtill continue of the ſame ſize as before, though vaſt quantities of earth are frequently waſhed down from them by the rains, which, together with the force of gravity, tending to level and bring them on an equality with the plains on which they ſtand, we might reaſonably think, ought by this time to have rendered them ſmaller than before. It muſt

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* Phil. Tranſ. Vol. 67.

† See Geography.

therefore be inquired into, By what natural cauſe the mountains were originally formed, and how they come to preſerve their ſize without any remarkable diminution?

4. The internal parts of the earth are ſtill more wonderful than the external. The utmoſt induſtry of man, indeed, can penetrate but a little way into it. As far as we can reach, however, it is found to be compoſed of diſſimilar ſtrata lying one upon another, not commonly in a horizontal direction, but inclined to the horizon at different angles. Theſe ſtrata ſeem not to be diſpoſed either according to the laws of gravity or according to their denſity, but as it were by chance. Beſides, in the internal parts of the earth are vaſt chaſms and vacuities. By what means were theſe ſtrata originally depoſited, the fiſſures and chaſms made, &c.?

5. In many places of the earth, both on the ſurface and at great depths under it, vaſt quantities of marine productions, ſuch as ſhells, &c. are to be met with. Sometimes theſe ſhells are found in the midſt of ſolid rocks of marble and limeſtone. In the very heart of the hardeſt ſtones, alſo, ſmall vegetable ſubſtances, as leaves, &c. are ſometimes to be found. The queſtion is, By what means were they brought thither?

Theſe are ſome of the moſt ſtriking difficulties which preſent themſelves to one who undertakes to write a natural hiſtory or theory of the earth. The moſt remarkable attempts to produce a theory of this kind are the following.

12 Dr Burnet's theory.

I. According to Dr Burnet, the earth was originally a fluid maſs, or chaos, compoſed of various ſubſtances differing both in denſity and figure. Thoſe which were moſt heavy, ſunk to the centre, and formed there a hard ſolid body: thoſe which were ſpecifically lighter remained next above; and the waters, which were lighteſt of all, covered the earth all round. The air, and other ethereal fluids, which are ſtill lighter than water, floated above it, and ſurrounded the globe alſo. Betweeen the waters, however, and the circumambient air, was formed a coat of oily and unctuous matter lighter than water. The air at firſt was very impure, and muſt neceſſarily have carried up with it many of thoſe earthy particles with which it was once blended: however, it ſoon began to purify itſelf, and depoſit thoſe particles upon the oily cruſt above mentioned; which, ſoon uniting together, the earth and oil became the cruſt of vegetable earth, with which the whole globe is now covered. His account of the deſtruction of the primeval world by the flood, by the falling down of the ſhell of earth into the waters of the abyſs, is given under the article DELUGE. It only remains then to give his account of the manner in which he relieves the earth from this univerſal deſtruction; and this he does as follows. Theſe great maſſes of earth, ſays he, falling into the abyſs, drew down with them vaſt quantities alſo of air; and by daſhing againſt each other, and breaking into ſmall parts by the repeated violence of the ſhock, they at length left between them large cavities filled with nothing but air. Theſe cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more viſible. The higher parts of its broken ſurface, now become the tops of mountains, were the firſt that appeared; the plains ſoon after came forward; and at length the whole globe was delivered from the waters, except the places in the loweſt ſituations; ſo that the ocean and ſeas are ſtill a part of the ancient abyſs, that have had no place to which they might return. Iſlands and rocks are fragments of the earth's former cruſt; continents are larger maſſes of its broken ſubſtance; and all the inequalities that are to be found on the ſurface of the preſent earth are effects of the confuſion into which both earth and water were at that time thrown.

13 Dr Woodward's.

II. Dr Woodward begins with aſſerting, that all terrene ſubſtances are diſpoſed in beds of various natures, lying horizontally one over the other, ſomewhat like the coats of an onion: that they are replete with ſhells, and other productions of the ſea; theſe ſhells being found in the deepeſt cavities, and on the tops of the higheſt mountains. From theſe obſervations, which are warranted by experience, he proceeds to obſerve, that theſe ſhells and extraneous foſſils are not productions of the earth, but are all actual remains of thoſe animals which they are known to reſemble; that all the ſtrata or beds of the earth lie under each other in the order of their ſpecific gravity, and that they are diſpoſed as if they had been left there by ſubſiding waters. All this he very confidently affirms, tho' daily experience contradicts him in ſome of them; particularly, we often find layers of ſtone over the lighteſt ſoils, and the ſofteſt earth under the hardeſt bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their ſpecific gravity, the lighteſt at top, and the heavieſt next the centre, he conſequently aſſerts, that all the ſubſtances of which the earth is compoſed were originally in a ſtate of diſſolution. This diſſolution he ſuppoſes to have taken place at the flood: but being aware of an objection, that the ſhells, &c. ſuppoſed to have been depoſited at the flood are not diſſolved, he exempts them from the ſolvent power of the waters, and endeavours to ſhow that they have a ſtronger coheſion than minerals; and that, while even the hardeſt rocks are diſſolved, bones and ſhells may remain entire.

14 Mr Whiſton's

III. Mr Whiſton ſuppoſes the earth to have been originally a comet; and conſiders the Moſaic account of the creation as commencing at the time when the Creator placed this comet in a more regular manner, and made it a planet in the ſolar ſyſtem. Before that time, he ſuppoſes it to have been a globe without beauty or proportion; a world in diſorder, ſubject to all the viciſſitudes which comets endure; which, according to the preſent ſyſtem of philoſophy, muſt be alternately expoſed to the extremes of heat and cold. Theſe alternations of heat and cold, continually melting and freezing the ſurface of the earth, he ſuppoſes to have produced, to a certain depth, a chaos reſembling that deſcribed by the poets, ſurrounding the ſolid contents of the earth, which ſtill continued unchanged in the midſt; making a great burning globe of more than 2000 leagues in diameter. This ſurrounding chaos, however, was far from being ſolid: he reſembles it to a denſe, though fluid atmoſphere, compoſed of ſubſtances mingled, agitated, and ſhocked againſt each other; and in this diſorder he ſuppoſes the earth to have been juſt at the eve of the Moſaic creation. But upon its orbit being then changed, when it was more regularly wheeled round the ſun, every thing took its proper place, every part of the ſurrounding fluid then fell into a certain ſituation according as it was light or heavy. The middle or central part, which always remained unchanged, ſtill continued ſo; retaining a part of that heat which it received in its primeval approaches towards the ſun; which heat he calculates may continue about 6000 years. Next to this fell the heavier parts of the chaotic atmoſphere, which ſerve to ſuſtain the lighter: but as in deſcending they could not entirely be ſeparated from many watery parts, with which they were intimately mixed, they drew down theſe alſo along with them; and theſe could not mount again after the ſurface of the earth was conſolidated: they therefore ſurrounded the heavy firſt-deſcending parts in the ſame manner as theſe ſurrounded the central globe. Thus the entire body of the earth is compoſed next the centre of a great burning globe: next this is placed an heavy terrene ſubſtance that encompaſſes it; round which is circumfuſed a body of water. Upon this body of water is placed the cruſt of earth on which we inhabit: ſo that, according to Mr Whiſton, the globe is compoſed of a number of coats or ſhells, one within the other, all of different denſities. The body of the earth being thus formed, the air, which is the lighteſt ſubſtance of all, ſurrounded its ſurface; and the beams of the ſun darting through, produced the light, which, we are told by Moſes, firſt obeyed the divine command.

The whole economy of the creation being thus adjuſted, it only remained to account for the riſings and depreſſions on the ſurface of the earth, with the other ſeeming irregularities of its preſent appearance. The hills and valleys are by him conſidered as formed by their preſſing upon the internal fluid which ſuſtains the external ſhell of earth, with greater or leſs weight: thoſe parts of the earth which are heavieſt ſink the loweſt into the ſubjacent fluid, and thus become valleys: thoſe that are lighteſt riſe higher upon the earth's ſurface, and are called *mountains*.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at preſent; the life of men and animals was extended to ten times it preſent duration; and all theſe advantages aroſe from the ſuperior heat of the central globe, which has ever ſince been cooling. As its heat was then in its full power, the genial principle was alſo much greater than at preſent; vegetation and animal increaſe were carried on with more vigour; and all nature ſeemed teeming with the ſeeds of life. But as theſe advantages were productive only of moral evil, it was found neceſſary to deſtroy all living creatures by a flood; and in what manner this puniſhment was accompliſhed, according to Mr Whiſton, is particularly taken notice of under the article DELUGE.

75
Mr Buffon's theory.

IV. M. Buffon's theory differs very widely from the foregoing. He begins with attempting to prove, that this world which we inhabit is no more than the ruins of a world. "The ſurface of this immenſe globe (ſays he) exhibits to our obſervation, heights, depths, plains, ſeas, marſhes, rivers, caverns, gulfs, volcanoes; and on a curſory view, we can diſcover in the diſpoſition of theſe objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, ſtones, bitumens, ſands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent deſign. Upon a nearer and more attentive inſpection, we diſcover ſunk mountains, caverns filled up, ſhattered rocks, whole countries ſwallowed up, new iſlands emerged from the ocean, heavy ſubſtances placed above light ones, hard bodies incloſed within ſoft bodies: in a word, we find matter in every form, dry and humid, warm and cold, ſolid and brittle, blended in a chaos of confuſion, which can be compared to nothing but a heap of rubbiſh, or the ruins of a world."

When taking a particular ſurvey of the external ſurface of the globe, he begins with the ocean, and the motion communicated to it by the influence of the ſun and moon which produces the tides.—"In examining the bottom of the ſea (ſays he), we perceive it to be equally irregular as the ſurface of the dry land. We diſcover hills and valleys, plains and hollows, rocks and earths of every kind; we diſcover likewiſe, that iſlands are nothing but the ſummits of vaſt mountains, whoſe foundations are buried in the ocean. We find other mountains whoſe tops are nearly on a level with the ſurface of the water; and rapid currents which run contrary to the general movement. Theſe currents ſometimes run in the ſame direction; at other times their motion is retrograde; but they never exceed their natural limits, which ſeem to be as immutable as thoſe which bound the efforts of land-rivers. On one hand we meet with tempeſtuous regions, where the winds blow with irreſiſtible fury; where the heavens and the ocean, equally convulſed, are mixed and confounded in the general ſhock; violent inteſtine motions, tumultuous ſwellings, water-ſpouts, and ſtrange agitations produced by volcanoes, whoſe mouths, tho' many fathoms below the ſurface, vomit forth torrents of fire; and puſh, even to the clouds, a thick vapour, compoſed of water, ſulphur, and bitumen; and dreadful gulphs or whirlpools, which ſeem to attract veſſels for no other purpoſe than to ſwallow them up. On the other hand we diſcover vaſt regions of an oppoſite nature, always ſmooth and calm, but equally dangerous to the mariner. To conclude, directing our eyes toward the ſouthern or northern extremities of the globe, we diſcover huge maſſes of ice, which, detaching themſelves from the polar regions, advance, like floating mountains, to the temperate climates, where they diſſolve and vaniſh from our view. The bottom of the ocean and the ſhelving ſides of rocks produce plentiful crops of plants of many different ſpecies: its ſoil is compoſed of ſand, gravel, rocks, and ſhells; in ſome places it is a fine clay, in others a compact earth: and in general, the bottom of the ſea has an exact reſemblance to the dry land which we inhabit.

"Let us next take a view of the dry land. Upon an attentive obſervation of this, we will find, that the great chains of mountains lie nearer the equator than the poles; that in the old continent their direction is more from eaſt to weſt than from ſouth to north; and that, on the contrary, in the new continent they extend more from north to ſouth than from eaſt to weſt. But what is ſtill more remarkable, the figure and direction of theſe mountains, which have a moſt irregular appearance, correſpond ſo wonderfully, that the prominent angles of one mountain are conſtantly oppoſite to the concave angles of the neighbouring mountain, and of equal dimenſions, whether they be ſeparated by an extenſive plain or a ſmall valley. I have further remarked, that oppoſite hills are always nearly of the ſame height; and that mountains generally occupy the middle of continents, iſlands, and promontories, dividing them by their greateſt lengths. I have likewiſe traced the courſes of the principal rivers, and find that their direction is nearly perpendicular to the ſea-coaſts into which they empty themſelves; and that during the greateſt part of their courſes they follow the direction of the mountains from which they derive their origin. The ſea-coaſts are generally bordered with rocks of marble and other hard ſtones; or rather with earth and ſand accumulated by the waters of the ſea, or brought down and depoſited by rivers. In oppoſite coaſts, ſeparated only by ſmall arms of the ſea, the different ſtrata or beds of earth are of the ſame materials. I find that volcanoes never exiſt but in very high mountains; that a great number of them are entirely extinguiſhed; that ſome are connected to others by ſubterranean paſſages, and their eruptions not unfrequently happen at the ſame time. There are ſimilar communications between certain lakes and ſeas. Some rivers ſuddenly diſappear, and ſeem to precipitate themſelves into the bowels of the earth. We likewiſe find certain mediterranean or inland ſeas, that conſtantly receive from many and great rivers prodigious quantities of water, without any augmentation of their bounds; probably diſcharging by ſubterraneous paſſages all thoſe extraneous ſupplies. It is likewiſe eaſy to diſtinguiſh lands which have been long inhabited, from thoſe new countries where the earth appears in a rude ſtate, where the rivers are full of cataracts, where the land is nearly overflowed with water or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

" Proceeding in our examination, we diſcover that the upper ſtratum of the earth is univerſally the ſame ſubſtance: that this ſubſtance, from which all animals and vegetables derive their growth and nouriſhment, is nothing but a compoſition of the decayed parts of animal and vegetable bodies, reduced into ſuch ſmall particles that their former organic ſtate is not diſtinguiſhable. Penetrating a little deeper, we find the real earth, beds of ſand, limeſtone, clay, ſhells, marble, gravel, chalk, &c. Theſe beds are always parallel to each other, and of the ſame thickneſs throughout their whole extent. In neighbouring hills, beds or ſtrata of the ſame materials are uniformly found at the ſame levels, though the hills be ſeparated by large and deep valleys. Strata of every kind, even of the moſt ſolid rocks, are uniformly divided by perpendicular fiſſures. Shells, ſkeletons of fiſhes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greateſt diſtances from the ſea. Theſe ſhells, fiſhes, and plants, are exactly ſimilar to thoſe which exiſt in the ocean. Petrified ſhells are to be met with almoſt every where in prodigious quantities: they are not only incloſed in rocks of marble and limeſtone, as well as in earths and clays, but are actually incorporated and filled with the very ſubſtances in which they are incloſed. In fine, I am convinced, from repeated obſervation, that marbles, limeſtones, chalks, marles, clays, ſand, and almoſt all terreſtrial ſubſtances, wherever ſituated, are full of ſhells and other ſpoils of the ocean."

From theſe poſitions, which he lays down as facts, Mr Buffon draws the following concluſions:

1. The changes which the earth has undergone within theſe laſt 2000 or 3000 years muſt be inconſiderable, when compared with the great revolutions that took place in thoſe ages immediately ſucceeding the creation. The reaſon he gives for this aſſertion is, that terreſtrial ſubſtances could not acquire ſolidity but by the continued action of gravity: hence the earth muſt have been originally much ſofter than it is now, and therefore more apt to be changed by cauſes which cannot now affect it.

2. It ſeems an incontrovertible fact, that the dry land which we now inhabit, and even the ſummits of the higheſt mountains, were formerly covered with the waters of the ſea; for ſhells and other marine bodies are ſtill found upon the very tops of mountains.

3. The waters of the ſea have remained for a long track of time upon the ſurface; becauſe in many places, ſuch immenſe banks of ſhells have been diſcovered, that it is impoſſible ſo great a multitude of animals could exiſt at the ſame time.

4. From this circumſtance it likewiſe appears, that although the materials on the ſurface of the earth were then ſoft, eaſily diſunited, moved, and tranſported by the waters, yet theſe tranſportations could not be ſuddenly effected: they muſt have been gradual and ſucceſſive, as ſea-bodies are ſometimes found more than 1000 feet below the ſurface; and ſuch a thickneſs of earth or ſtone could not be accumulated in a ſhort time.

5. It is impoſſible theſe effects could be owing to the univerſal deluge. For though we ſhould ſuppoſe that all the ſhells in the bottom of the ocean ſhould be depoſited upon the dry land; yet, beſides the difficulty of eſtabliſhing this ſuppoſition, it is plain, that as ſhells are found incorporated in marble, and in the rocks of the higheſt mountains, we muſt ſuppoſe theſe rocks and marbles to have been formed all at the very inſtant when the deluge took place; and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind ſimilar to what we are now acquainted with; as they all, with few exceptions, contain ſhells and other productions of the ocean. Beſides, at the time of the univerſal deluge, the earth muſt have acquired a conſiderable degree of ſolidity, by the action of gravity for more than 16 centuries. During the ſhort time the deluge laſted, therefore, it is impoſſible that the waters ſhould have overturned and diſſolved the whole ſurface of the earth to the greateſt depths.

6. It is certain (for what reaſon he does not mention), that the waters of the ſea have, at ſome period or other, remained for a ſucceſſion of ages upon what we now know to be dry land; and conſequently that the vaſt continents of Aſia, Europe, Africa, and America, were then the bottom of an immenſe ocean, replete with every thing which the preſent ocean produces.

7. It is likewiſe certain, that the different ſtrata of the earth are horizontal and parallel to each other. This parallel ſituation muſt therefore be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the ſame poſition which the water itſelf invariably aſſumes.

8. It is certain that theſe ſtrata muſt have been gra-

dually formed, and are not the effect of any ſudden revolution; becauſe nothing is more frequent than ſtrata compoſed of heavy materials placed above light ones; which never could have happened if, according to ſome authors, the whole had been blended and diſſolved by the deluge, and afterwards precipitated.

9. No other cauſe than the motion and ſediments of water could poſſibly produce the regular poſition of the various ſtrata of which the ſuperficial part of this earth conſiſts. The higheſt mountains are compoſed of parallel ſtrata, as well as the loweſt valleys. Of courſe, the formation of mountains cannot be attributed to the ſhock of earthquakes, or to the eruptions of volcanoes. Such ſmall eminences as have been raiſed by volcanoes or convulſions of the earth, inſtead of being compoſed of parallel ſtrata, are mere maſſes of weighty materials, blended together in the utmoſt confuſion.

Having now, as he thinks, *proved*, that the dry and habitable part of the earth has remained for a long time under the waters of the ſea, and conſequently muſt have undergone the ſame changes that now take place at the bottom of the ſea, he proceeds to inquire what theſe changes are.

10. The ocean, ſince the creation of the world, has been conſtantly agitated by the tides, occaſioned by the action of the ſun and moon; and this agitation is greater in the equatorial than in the other parts of the globe, becauſe the action of the ſun and moon is there ſtrongeſt.

11. The earth performs a rapid motion on its axis; and conſequently its parts have a centrifugal force, which is alſo greateſt at the equator,

12. From the combined action of the two laſt mentioned cauſes, the tides and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect ſphere, its diurnal motion, and the ebbing and flowing of the tides, muſt neceſſarily, in a ſucceſſion of time, have elevated the equatorial parts, by gradually carrying mud, earth, ſand, ſhells, &c. from other climates, and depoſiting them at the equator.

13. On this ſuppoſition, the greateſt inequalities on the ſurface of the earth ought to be found, and in fact are found, in the neighbourhood of the equator.

14. As the alternate motion of the tides has been conſtant and regular ſince the exiſtence of the world, it is natural to think, that, at each tide, the water carries from one place to another a ſmall quantity of matter, which falls to the bottom as a ſediment, and forms thoſe horizontal and parallel ſtrata that every where appear. Here it may indeed be objected, that as the flux is equal to, and regularly ſucceeded by, the reflux, the two contrary motions will balance each other; and whatever is brought in by the flux will be carried back by the reflux. The motion of the ocean, therefore, could never be the cauſe of the formation even of parallel ſtrata; much leſs of mountains, and all the inequalities to be obſerved in this globe. To this Mr Buffon replies, that the alternate motion of the waters is by no means equal; for the ſea has a continual motion from eaſt to weſt: the agitations occaſioned by the winds likewiſe produce great inequalities in the tides. It muſt alſo be acknowledged, that, by every motion of the ſea, particles of earth and other matter muſt be carried from one place and depoſited in another; and that theſe collections of matter muſt aſſume the form of parallel and horizontal ſtrata. Laſtly, this objection is obviated by a well known fact. On all coaſts where the ebbing and flowing of the ſea is diſcernible, numberleſs materials are brought in by the flux, which are not carried back by the reflux. The ſea gradually increaſes on ſome places and recedes from others; narrowing its limits by depoſiting earth, ſand, ſhells, &c. which naturally take a horizontal poſition. Theſe materials when accumulated, and elevated to a certain degree, gradually ſhut out the water, and remain for ever in the form of dry land.

15. The poſſibility of a mountain's being formed at the bottom of the ſea by the motion and ſediments of the water, will appear from the following conſiderations. On a coaſt which the ſea waſhes with violence during the flow of tide, ſome part of the earth muſt be carried off at every ſtroke of the waves. Even where the ſea is bounded by a rock, it is a known fact, that the rock itſelf is greatly waſted by the water; and conſequently that ſmall particles are carried off by the retreat of every wave. Thoſe particles of earth or ſtone are neceſſarily tranſported to ſome diſtance. Whenever the agitation of the water ceaſes, the particles are precipitated in the form of a ſediment, and lay the foundation of a firſt ſtratum, which is either horizontal or inclined, according to the ſituation of the ſurface on which they fall. This ſtratum is ſoon ſucceeded by another, produced by the ſame cauſe; and thus a conſiderable quantity of matter will be amaſſed, and depoſited in parallel beds. In proceſs of time this gradually accumulating maſs will become a mountain in the bottom of the ſea, exactly reſembling, both in external and internal ſtructure, thoſe mountains which we ſee on the dry land. If there happened to be ſhells in that part of the bottom of the ſea where we have ſuppoſed the ſediments to be depoſited, they will be covered, filled, and incorporated with the depoſited matter, and form a part of the general maſs. Theſe ſhells will be lodged in different parts of the mountain, correſponding to the times in which they were depoſited: thoſe which lay at the bottom before the firſt ſtratum was formed, will occupy the loweſt ſtation; the others will be found in places more elevated.

16. It has been imagined that the agitation of the ſea produced by the winds and tides is only ſuperficial, and does not affect the bottom, eſpecially where it lies very deep. But it ought to be remembered, that whatever be the depth, the whole maſs is put in motion by the tides at the ſame time; and that, in a fluid globe, this motion would be communicated even to the centre. The attractive power, which occaſions the flux and reflux, is penetrating. It acts equally upon every particle of the maſs; ſo that the quantity of its force at different depths may be determined by calculation. We cannot therefore heſitate in pronouncing, that the tides, the winds, and all other cauſes of motion in the ſea, muſt produce heights and inequalities in its bottom; and that theſe heights muſt uniformly be compoſed of regular ſtrata either horizontal or inclined. The heights thus produced will gradually augment; like the waves which formed them, they will mutually reſpect each other; and if the extent of the

baſe be great, in a courſe of years they will form a vaſt chain of mountains.

17. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce currents. Between two neighbouring heights in the bottom of the ocean there muſt be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately oppoſite through the whole extent of its courſe. Theſe heights muſt continually increaſe: for, during the flow, the water will depoſit its ordinary ſediment upon their ridges; and the waters which are impelled by the current will force along, from great diſtances, quantities of matter, which will ſubſide between the hills, and, at the ſame time, ſcoop out a valley with correſponding angles at their foundation. Now, by means of theſe different motions and ſediments, the bottom of the ocean, though formerly ſmooth, muſt ſoon be furrowed and interſperſed with hills and chains of mountains, as we actually find it at preſent. The ſoft materials of which the eminences were originally compoſed, would gradually harden by their own gravity. Such of them as conſiſted of ſandy and cryſtalline particles would produce thoſe enormous maſſes of rock and flint, in which we find cryſtals and other precious ſtones. Others, compoſed of ſtony particles mixed with ſhells, give riſe to thoſe beds of limeſtone and marble in which vaſt quantities of ſea-ſhells are ſtill found incorporated.

18. Theſe cauſes, as before obſerved, act with greater force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The mountains of Africa and Peru are the higheſt in the world; often extending through whole continents, and ſtretching to great diſtances under the waters of the ocean. The mountains of Europe and Aſia, which extend from Spain to China, are not ſo high as thoſe of Africa and South America. According to the relations of voyagers, the mountains of the north are but ſmall hills, when compared with the mountains of the equatorial regions. Thoſe prodigious chains of mountains which run from eaſt to weſt in the old continent, and from north to ſouth in the new, muſt have been formed by the general motion of the tides. But the origin of the leſs conſiderable hills muſt be aſcribed to particular motions occaſioned by winds, currents, and other irregular agitations of the ſea.

16
How the earth was deſerted by the ocean, and left dry.

Having thus diſcuſſed ſome very important points reſpecting the theory of the earth, our author now proceeds to anſwer other queſtions which ſeem ſtill more difficult of ſolution.

19. But how has it happened that this earth, which we and our anceſtors have inhabited for ages, which, from time immemorial, has been an immenſe continent, dry, compact, and removed from the reach of water, ſhould, if formerly the bottom of an ocean, be now exalted to ſuch a height above the waters, and ſo completely ſeparated from them? Since the waters remained ſo long upon the earth, why have they now deſerted it? What accident, what cauſe, could introduce a change ſo great? A little reflection, ſays he, will furniſh us with at leaſt plauſible ſolutions to theſe ſeemingly ſo difficult queſtions. We daily obſerve the ſea gaining ground on certain coaſts, and loſing it on others. We know that the ocean has a general and uniform motion from eaſt to weſt: that it makes violent efforts againſt the rocks and low grounds which encircle it; that there are whole provinces which human induſtry can hardly defend againſt the fury of the waves; and that there are inſtances of iſlands which have but lately emerged from the waters, and of regular inundations. Hiſtory informs us of inundations and deluges of a more extenſive nature. Ought not all this to convince us, that the ſurface of the earth has experienced very great revolutions, and that the ſea may have actually given up poſſeſſion of the greateſt part of the ground which it formerly occupied? For example, let us ſuppoſe, that the old and new worlds were formerly but one continent; and that, by a violent earthquake, the ancient Atlantis of Plato was ſunk. The conſequence of this mighty revolution muſt neceſſarily be, that the ſea would ruſh in from all quarters, and form what is now called the *Atlantic Ocean*; and vaſt continents, perhaps thoſe we now inhabit, would of courſe be left dry. This great revolution might be effected by the ſudden failure of ſome immenſe cavern in the interior parts of the globe, and an univerſal deluge would infallibly ſucceed.

20. But, however conjectures of this kind may ſtand, it is certain that ſuch a revolution hath happened: and we may even believe that it hath happened naturally; for if a judgment of the future is to be formed from the paſt, we have only to attend carefully to what paſſes before our eyes. It is a fact eſtabliſhed by the repeated obſervation of voyagers, that the ocean has a conſtant motion from eaſt to weſt. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have approached. As a neceſſary conſequence of this motion, the Pacific Ocean muſt make continual efforts againſt the coaſts of Tartary, China, and India; the Indian Ocean muſt act againſt the eaſt coaſt of Africa; and the Atlantic muſt in a ſimilar manner act againſt all the eaſtern coaſts of America. Hence the ſea muſt have gained, and will always continue to gain, on the eaſt, and to loſe on the weſt. This of itſelf would be ſufficient to prove the poſſibility of the change of the ſea into land, and land into ſea. If ſuch is the natural effect of the ſea's motion from eaſt to weſt, may it not reaſonably be ſuppoſed, that Aſia, and all the eaſtern continent, is the moſt ancient country in the world? and that Europe, and part of Africa, eſpecially the weſt parts of theſe continents, as Britain, France, Spain, &c. are countries of a more recent date?

21. The cauſe of the perpendicular fiſſures with which the earth abounds, is eaſily inveſtigated. As various materials conſtituting the different ſtrata were tranſported by the waters, and depoſited in the form of ſediments, they would at firſt be in a very diluted ſtate, and would gradually harden and part with the ſuperfluous quantity of moiſture they contained. In proceſs of time, drying, they would naturally contract and ſplit at irregular diſtances. Theſe fiſſures neceſſarily aſſumed a perpendicular direction: becauſe in this direction the action of gravity of one particle upon another is equal to nothing: but it acts directly oppoſite to this deſcription, in a horizontal ſituation: the di-

minution in bulk could have no ſenſible effect but in a vertical line. The contraction of the parts in drying, therefore, and not the contained water forcing an iſſue, as has been alleged by ſome, is the cauſe of perpendicular fiſſures; for it may be often remarked, that the ſides of thoſe fiſſures, through their whole extent, correſpond as exactly as the two ſides of a ſplit piece of wood.

22. Perpendicular fiſſures vary greatly as to the extent of their openings. Some are about half an inch or an inch; others a foot or two feet; ſome extend ſeveral fathoms, and give riſe to thoſe vaſt precipices which ſo frequently occur between oppoſite parts of the ſame rocks, in the Alps and other high mountains. It is plain, that the fiſſures, the openings of which are ſmall, have been occaſioned ſolely by drying. But thoſe which extend ſeveral feet are partly owing to another cauſe; namely, the ſinking of the foundation upon one ſide, while that of the other remains firm. If the baſe ſinks but a line or two, when the height is conſiderable, an opening of ſeveral feet, or even fathoms, will be the conſequence. When rocks are founded on clay or ſand, they ſometimes ſlip a little to one ſide; and the fiſſures are of courſe augmented by this motion.

23. The large openings, however, and prodigious cuts, which are to be met with in rocks and mountains, are to be aſcribed to another cauſe. They could be produced no other way than by the ſinking of immenſe ſubterraneous caverns, that were unable any longer to ſuſtain their incumbent load. But theſe cuts or intervals in mountains are not of the ſame nature with the perpendicular fiſſures: they appear to have been ports opened by the hand of nature for the communication of nations. This ſeems to be the intention of all large openings in chains of mountains, and of thoſe ſtraits by which different parts of the ocean are connected; as the ſtraits of Thermopyle, of Gibraltar, &c. the gaps or ports in mount Caucaſus, the Cordeleras, &c.

24. But the greateſt changes upon the ſurface of the earth are occaſioned by rains, rivers, and torrents from the mountains. Theſe derive their origin from vapours raiſed by the ſun from the ſurface of the ocean, and which are tranſported by the winds through every climate. The progreſs of theſe vapours, which are ſupported by the air, and tranſported at the pleaſure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or ſnow. At firſt, theſe waters deſcended into the plains without any fixed courſe; but they gradually hollowed out proper channels for themſelves. By the power of gravity they ran to the bottom of the mountains; and penetrating or diſſolving the lower grounds, they carried along with them ſand and gravel, cut deep furrows in the plains, and thus opened paſſages to the ſea, which always receives as much water by rivers as it loſes by evaporation. The windings in the channels of rivers have uniformly correſponding angles on their oppoſite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are ſeparated, have likewiſe ſinuoſities with correſponding angles, this circumſtance ſeems to demonſtrate, that the valleys have been gradually formed by currents of the ocean, in the ſame manner as the channels of rivers have been produced. Rivers produce conſiderable changes on the ſurface of the earth; they carry off the ſoil, wear away the moſt ſolid rocks, and remove every thing that oppoſes their paſſage. The waters of the clouds alſo, which deſcend upon the mountains, by continually waſhing away ſome part of the earth, tend to level them with the plains; and would undoubtedly do ſo, if time enough were allowed for that purpoſe.

25. From what has been advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the ſurface of the earth: that currents of the ſea have ſcooped out the valleys, elevated the hills, and beſtowed on them the correſponding directions: that the ſame waters of the ocean, by tranſporting and depoſiting earth, &c. have given riſe to the parallel ſtrata: that the waters from the heavens gradually deſtroy the effects of the ſea, by continually diminiſhing the height of the mountain, filling up the valleys, and choaking up the mouths of rivers; and by reducing every thing to its proper level, they will in time reſtore the earth to the ſea, which by its natural operations will again create new continents interſperſed with mountains and valleys, and every way ſimilar to thoſe which we now inhabit.

17
Buffon's account of the formation of the planets.

Thus far our author preſerves ſome degree of plauſibility in his reaſoning; but in his account of the original formation of the earth, he certainly goes to the utmoſt verge of *probability*, or rather of *poſſibility*, in his ſuppoſitions. According to him, all the planets in our ſyſtem were originally parts of the ſun himſelf. They were detached from his body all at once by a mighty ſtroke of a comet. The poſſibility of driving off ſuch a quantity of matter from the ſun by a ſingle ſtroke, he labours hard to prove; but this is far from being the greateſt difficulty in his ſyſtem.—" To this theory (ſays he) it may be objected, that if the planets had been driven off from the ſun by a comet, in place of deſcribing circles round him, they muſt, according to the law of projectiles, have returned to the ſame place from whence they had been forced; and, therefore, that the projectile force of the planets cannot be attributed to the impulſe of a comet.

" I reply, that the planets iſſued not from the ſun in the form of globes, but in the form of torrents; the motion of whoſe anterior particles behoved to be accelerated by thoſe behind, and the attraction of the anterior particles would alſo accelerate the motion of the poſterior; and that this acceleration, produced by one or both of theſe cauſes, might be ſuch as would neceſſarily change the original motion ariſing from the impulſe of the comet; and that, from the cauſe, might reſult a motion ſimilar to what takes place in the planets; eſpecially when it is conſidered, that the ſhock of the comets removes the ſun out of its former ſtation. This reaſoning may be illuſtrated by an example. Suppoſe a muſket-ball diſcharged from the top of a mountain, and that the force of the powder was ſufficient to ſend it beyond a ſemidiameter of the earth: it is certain that this ball would revolve round the earth, and return at every revolution to the place from whence it had been diſcharged. But, inſtead of a muſket-ball, if a rocket were employed, the continued action of the fire would greatly accelerate the original impulſive motion. This rocket would by no means return to the ſame point like the ball; but, *cæteris paribus*, would deſcribe an orbit, the perigee of which would be more or leſs diſtant from the earth in proportion to the greatneſs of the change produced in its direction by the accelerating force of the fire. In the ſame manner, if the original projectile force impreſſed by the comet on the torrent of ſolar matter was accelerated, it is probable that the planets formed by this torrent acquired their circular or elliptical movements around the ſun."

In like manner he accounts for the formation and circulation of the ſecondary planets. The revolutions of the primaries on their axes, he accounts for from the obliquity of the original ſtroke impreſſed by the comet. The oblate ſpheroidal figure of the earth is eaſily deduced from its diurnal motion, and the fluidity of the whole at its firſt formation. The flattening at the poles he eſtimates at about one 230th part of the whole. As this computation differs conſiderably from the account given by the mathematicians who were ſent to different parts of the world on purpoſe to determine the figure of the earth, and who made the flatneſs at the poles equal to one 175th part of the whole, he ſuppoſes this difference to have ariſen from changes that have ſince taken place on the ſurface of the earth, occaſioned by the cauſes already mentioned. He then proceeds to account for the formation of all things, in the following manner.—"It is therefore evident, that the earth aſſumed its figure when in a melted ſtate; and, to purſue our theory, it is natural to think, that the earth, when it iſſued from the ſun, had no other form but that of a torrent of melted and inflamed matter: that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a ſpheroid: that when the earth cooled, the vapours, which were expanded like the tail of a comet, gradually condenſed, and fell down in the form of water upon the ſurface, depoſiting at the ſame time a ſlimy ſubſtance mixed with ſulphur and ſalts; part of which was carried by the motion of the waters into the perpendicular fiſſures of the ſtrata, and produced metals; and the reſt remained on the ſurface, and gave riſe to the vegetable mould which abounds in different places, with more or leſs of animal or vegetable particles, the organization of which is not obvious to the ſenſes.

"Thus the interior parts of the globe were originally compoſed of vitrified matter; and, I believe, they are ſo at preſent. Above this vitrified matter were placed thoſe bodies which the fire had reduced to the ſmalleſt particles, as ſands, which are only portions of glaſs; and above theſe pumice-ſtones and the ſcoriæ of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condenſation of the vapours when the earth began to cool. This water depoſited a ſtratum of mud, mixed with all thoſe matters which are capable of being ſublimed or exhaled by fire: and the air was formed of the moſt ſubtile vapours, which, from their levity, roſe above the water.

"Such was the condition of the earth when the tides, the winds, and the heat of the ſun, began to introduce changes on its ſurface. The diurnal motion of the earth, and that of the tides, elevated the waters in the equatorial regions, and neceſſarily tranſported thither great quantities of ſlime, clay, and ſand; and by thus elevating thoſe parts of the earth, they perhaps ſunk thoſe under the poles about two leagues, or a 230th part of the whole, as was formerly remarked: for the waters would eaſily reduce into powder pumice-ſtones, and other ſpongy parts of the vitrified matter upon the ſurface; and by this means excavate ſome places and elevate others, which, in time, would produce iſlands and continents, and all thoſe inequalities on the ſurface, which are more conſiderable towards the equator than towards the poles. The higheſt mountains lie between the tropics and the middle of the temperate zones, and the loweſt from the polar circles towards the poles. Indeed, both the land and ſea have moſt inequalities between the tropics, as is evident from the incredible number of iſlands peculiar to thoſe regions."

18
Dr Hutton's theory.

V. In the firſt volume of the Edinburgh Philoſophical Tranſactions a new theory of the earth has been laid down at conſiderable length by Dr Hutton; of which the following is an abſtract.

The general view of the terreſtrial ſyſtem conveys to our minds an idea of a "fabric, erected in wiſdom, to obtain a purpoſe worthy of the power that is apparent in the production of it."

19
Earth formed to be inhabited.

The end for which it was formed, as far as we can comprehend our author's meaning, is, that it might be an habitation for living creatures; and we are enabled to underſtand the conſtitution of this earth as a thing formed by deſign, "not only by ſeeing thoſe general operations which depend on its conſtruction as a machine, but alſo by perceiving how far the particulars in the conſtruction of that machine depend on the operations of the globe."

20
Compoſed of three principal parts.

In taking a comprehenſive view of the mechaniſm of the globe, we obſerve three principal parts of which it is compoſed; and which, by being properly adapted to one another, form it into an habitable world. Theſe are the ſolid body of the earth, the waters of the ocean, and the atmoſphere ſurrounding the whole. On theſe our author obſerves,

1. The parts of the terreſtrial globe more immediately expoſed to our view are ſupported by a central body commonly ſuppoſed, but without any good reaſon, to be ſolid and inert.

2. The aqueous part, reduced to a ſpherical form by gravitation, has become oblate by the earth's centrifugal force. Its uſe is to receive the rivers, be a fountain of vapours, and to afford life to innumerable animals, as well as to be the ſource of growth and circulation to the organized bodies on earth.

3. The irregular body of land, raiſed above the level of the ſea (though the ſmalleſt of theſe large diviſions), is by far the moſt intereſting, as immediately neceſſary to the ſupport of animal life.

4. The atmoſphere ſurrounding the whole is evidently neceſſary for innumerable purpoſes of life and vegetation, neither of which could ſubſiſt a moment without it.

21
Powers by which it is upheld.

Having thus conſidered the mechaniſm of the globe, Dr Hutton proceeds to inveſtigate the powers by which it is upheld.—Theſe are the gravitating and projectile forces by which the planets are guided, the influence of light and heat, cold and condenſation; to which may be added electricity and magnetiſm.

22 Why the land muſt neceſſarily decay, and at laſt be deſtroyed.

In the further purſuit of our general or preparatory ideas, the Doctor obſerves, that "a ſolid body of land could not have anſwered the purpoſe of a habitable world, for a ſoil is neceſſary for the growth of plants; but a ſoil is only the materials collected from the deſtruction of the ſolid land. Therefore the ſurface of this land, inhabited by man, is made by nature to decay, in diſſolving from the hard and compact ſtate in which it is found below the ſoil; and this ſoil is neceſſarily waſhed away by the continual circulation of the water running from the ſummits of the mountains." Thus he ſuppoſes that the land muſt at laſt be entirely deſtroyed; a misfortune unavoidable from the very conſtitution of the globe as an habitable world. It remains, therefore, to be conſidered, whether there be, "in the conſtitution of this world, a reproductive operation by which a ruined conſtitution may be again repaired, and a duration and ſtability procured to the machine conſidered as capable of ſuſtaining plants and animals?" The ſolution of this queſtion, he ſays, is perhaps within the reach of human ſagacity, and, as he juſtly obſerves, might add ſome luſtre to ſcience and the human intellect.

23 Marine animals of much higher antiquity than the human race.

With regard to the beginning of the world, though our author does not pretend to lay aſide the Moſaic accounts concerning the origin of man, yet, ſays he, "though there has not been found in natural hiſtory any document by which a high antiquity might be attributed to the human race, this is not the caſe with regard to the inferior animals, particularly thoſe which inhabit the ocean and its ſhores. We find in natural hiſtory monuments which prove that theſe animals had long exiſted; and we thus procure a meaſure for the computation of a period of time extremely remote, though far from being exactly aſcertained.—Thus, in finding the relics of ſea animals of every kind in the ſolid body of the earth, a natural hiſtory of thoſe animals is formed, which includes a certain portion of time; and for the aſcertaining this portion of time, we muſt again have recourſe to the operations of this world.

From a view of the preſent conſtruction and operations of nature, therefore, our author ſuppoſes, that we may underſtand what has formerly paſſed in the original formation of the globe; and then proceeds to reaſon in the following manner:

24 General view of the ſolid parts of the globe.

The ſolid parts of the globe are, in general, compoſed of ſand, gravel, argillaceous and calcareous ſtrata, or of theſe mixed with ſome other ſubſtances. Sand is ſeparated and ſized by ſtreams and currents; gravel is formed by the mutual attrition of ſtones agitated in water; and marly or argillaceous ſtrata have been collected by ſubſiding in water in which thoſe earthy ſubſtances had floated. Thus, ſo far as the earth is formed of theſe materials, it would appear to have been the production of water, winds, and tides.

25 Earth in a great meaſure compoſed of the exuviæ of marine animals.

The next inquiry of our author is into the origin of our land, which he ſeems willing to derive entirely from the exuviæ of marine animals. The only argument he makes uſe of for determining this moſt important point is drawn from the quantity of them to be met with in the different parts of it. "We find (ſays he) the marks of marine animals in the moſt ſolid parts of the earth; conſequently thoſe ſolid parts have been formed after the ocean was inhabited by thoſe animals which are proper to that fluid medium."

26 Marble and limeſtone totally to be derived from theſe.

That all the maſſes of marble or limeſtone are compoſed of the calcareous matter of marine bodies, he concludes, 1. From there being few in which ſome of thoſe objects may not be found which indicate the marine origin of the maſs; and a ſingle cockle-ſhell or piece of coral found in a marble or limeſtone quarry, will certainly prove it to have been originally at the bottom of the ſea as much as if it had been all compoſed of ſuch bodies. 2. In the calcareous ſtrata, which are evidently of marine origin, there are many parts of a ſparry ſtructure; which ſhows that in theſe places the original texture of thoſe beds has been diſſolved and a new ſtructure aſſumed. This change is produced by cryſtallization, in conſequence of a previous ſtate of fluidity; which has ſo diſpoſed the concreting parts, as to allow them to aſſume a regular ſhape and ſtructure proper to that ſubſtance. 3. There are, in all the regions of the earth, huge maſſes of calcareous matter in that cryſtalline or ſparry ſtate, in which perhaps no veſtige can be found of any organized body, nor any indication that ſuch calcareous matter had belonged to animals; but as, in other maſſes, this ſparry or cryſtalline ſtate is evidently aſſumed by the calcareous matter of the marine productions, we have no reaſon to derive theſe from any other ſource: and hence, ſays our author, we are led to conclude, that all the ſtrata of the earth, not only thoſe conſiſting of ſuch calcareous maſſes, but others ſuperincumbent upon theſe, have had their origin at the bottom of the ſea, by the collection of ſand and gravel, of ſhells, of coralline and cruſtaceous bodies, and of earths and clays variouſly mixed, or ſeparated and accumulated.

27 Almoſt the whole body of earth formed at the bottom of the ſea.

"The general amount of our reaſoning (ſays he) is this; that nine-tenths perhaps, or 99 hundredths, of this earth, ſo far as we ſee, have been formed by natural operations of the globe, in collecting looſe materials and depoſiting them at the bottom of the ſea, conſolidating thoſe collections in various degrees, and either elevating thoſe conſolidated maſſes above the level on which they were formed, or lowering the level of that ſea."

28 Could not be raiſed from thence by any motion of the water.

With regard to the raiſing of the land, thus formed at the bottom of the ſea, to ſome height above its ſurface, our author differs from Buffon, and contends, that "no motion of the ſea occaſioned by the earth revolving in this ſolar ſyſtem could bring about that end; for let us ſuppoſe the axis of the earth to be changed from the preſent poles and placed in the equinoctial line, the conſequence of this might indeed be the formation of a continent of land about each new pole, from whence the ſea would run towards the new equator; but all the reſt of the globe would remain an ocean. Some new points might be diſcovered, and others which appeared before above the ſurface of the ſea would be ſunk by the riſing of the water; but, on the whole, land could only be gained ſubſtantially at the poles. Nor could the continents, even ſuppoſing they had been originally produced in this manner, have continued ſtationary for many thouſand years, and preſented to us, every where below their ſurface, maſſes of conſolidated marble and other mineral ſubſtances, in a ſtate as different as poſſible from what they were originally. Beſides an operation, therefore, by which the earth at the bottom of the ſea ſhould be converted into an elevated land, or placed high above the level of the ocean, there is required a conſolidating power, by which the looſe materials that had ſubſided from water ſhould be formed into maſſes of the moſt perfect ſolidity, having neither water nor vacuity betwixt their conſtituent parts, nor in the pores of theſe conſtituent parts themſelves.

29
Conſolidating power of the ſtrata to be diſcovered by an inſpection of the materials themſelves.

This conſolidating power, he is of opinion, muſt lie out of the reach of common obſervation, becauſe the conſolidated maſſes on the ſurface of the earth are now in a ſtate of decay; and therefore we muſt look into theſe maſſes themſelves, in order to diſcover the cauſe by which they aſſumed their preſent form.

30
Conſequences of ſuppoſing the ſtrata to be conſolidated by aqueous ſolution.

In entering upon the inveſtigation of this conſolidating power, our author obſerves, that there are only two ways in which the requiſite changes can happen, viz. ſimple congelation from a fluid ſtate, or a continual accretion of ſolid particles. Fire and water, therefore, may be conſidered as the general agents in this operation; and we are to conſider whether they have acted in the way of aqueous ſolution and cryſtallization, or in that of fuſion. If the former of theſe ways is ſuppoſed to be that in which the ſtrata in general have been conſolidated, we may look for a conſiderable degree of uniformity in its effects. "The action of water (he ſays) upon all different ſubſtances is what we are well acquainted with; and there is no reaſon to conclude any thing myſterious in its operation, unleſs we ſuppoſe an immenſe compreſſing power to have ſome effect in altering it. Compreſſion, however (he ſays), only alters the relation of evaporation to heat, or changes the degree of heat which water can contain. We are therefore to look for no occult quality in water acting at the bottom of the ſea more than on the ſurface of the earth. Time, indeed, may do a great deal where the courſe of the operation is ſlow; but where it is contrary to the nature of the things to produce the change in queſtion, it is plain that no length of time can have any effect."

31
Difficulties attending this ſuppoſition.

Again, if the maſſes have been conſolidated by cryſtallization, the bodies muſt firſt have been diſſolved in water as a menſtruum; and therefore another power is to be ſought for by which the water might again be extricated from thoſe endleſs labyrinths in which the ſolid matter of the ſtrata is depoſited, without leaving a fluid particle in its compoſition. There is likewiſe another difficulty in finding a ſource from whence the vaſt quantity of matter depoſited in theſe ſtrata ſhould be derived. Beſides, the water contained in the cavities and interſtices of theſe bodies compoſing ſtrata muſt be in a ſtagnating ſtate; and conſequently it can only act on the ſurface of thoſe cavities which are to be filled up. "But with what are they to be filled? Not with water; they are full of this already: Not with the ſubſtance of thoſe bodies which contain the water; this would be only to make one cavity in order to fill up another. If, therefore, the cavities of the ſtrata are to be filled with ſolid matter by means of water, there muſt be made to paſs through theſe porous maſſes water impregnated with ſome other ſubſtances in a diſſolved ſtate, and the aqueous menſtruum muſt be ſeparated from the diſſolved ſubſtance, and to depoſit the ſame in cavities through which the ſolution moves." This ſuppoſition is, however, according to our author, inadmiſſible; for, in the caſe of materials accumulated in the bottom of the ocean, there is no proper means for ſeparating the diſſolved matter from the water included in theſe enormous maſſes; nor are there any means by which a circulation in thoſe maſſes may be formed.

32
Strata conſolidated by ſubſtances inſoluble in water.

In the further proſecution of his ſubject, our author informs us, that "if water had been the menſtruum by which the conſolidating matter was introduced into the cavities of the ſtrata, maſſes of thoſe bodies that are ſoluble in water could only be found conſolidated; and theſe only in ſuch a ſtate as the ſimple ſeparation of the diſſolving water might produce. But this is far from being the caſe. We have ſtrata conſolidated by calcareous ſpar; a thing perfectly diſtinguiſhable from the ſtalactical concretion of the calcareous earth in conſequence of aqueous ſolution. We have ſtrata made ſolid by the formation of fluor; a ſubſtance, ſo far as we know, not ſoluble in water. We have ſtrata conſolidated with ſulphureous and bituminous ſubſtances, which do not correſpond to the ſolution in water. We have ſtrata conſolidated with ſiliceous matter in a ſtate totally different from that in which it is depoſited by water: we have them alſo conſolidated by almoſt all the various metallic ſubſtances, with their almoſt endleſs mixtures and ſulphureous compoſitions; that is to ſay, we find perhaps every different ſubſtance introduced into the interſtices of ſtrata which had been formed by ſubſidence at the bottom of the ſea."

33
Theſe probably conſolidated by heat and fuſion.

For theſe reaſons, our author thinks it more probable that the ſtrata have been conſolidated by heat and fuſion; and this hypotheſis, he imagines, will ſolve every difficulty. And as the queſtion is of the greateſt importance to natural hiſtory, he propoſes to inveſtigate it at great length; at the ſame time that the ſubject is generalized as much as poſſible.

34
Siliceous bodies ſuppoſed abſolutely inſoluble by water.

He conſiders, that among the various ſtrata which compoſe the earth, we find ſome ſtrata formed of *ſiliceous* and ſome of ſulphureous materials; and with one or other, or both of theſe ſubſtances, the ſtrata are ſo intimately mixed, that what has changed the ſiliceous or ſulphureous materials from a fluid to a ſolid ſtate, muſt likewiſe have materially affected the ſtrata which contain them. The former he looks upon to be abſolutely inſoluble in water; and there are many other bodies whoſe ſolubility is ſo ſmall, that it could not be diſcovered but by means of the ſiliceous matter. Of this an inſtance is adduced in the feldt-ſpar, a compound of ſiliceous, argillaceous, and calcareous earth, intimately united together; which being for ages expoſed to the weather, the calcareous part is diſſolved, and the ſiliceous left in form of a white ſoft earth; though it is uncertain whether this diſſolution be performed by means of pure water, or whether an acid be alſo concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyſer in Ireland; but he thinks that here it muſt be diſſolved by an alkali, one of the natural ſolvents of this earth. "It may therefore be aſſerted (ſays he), that no ſiliceous body having the hardneſs of flint, nor any cryſtallization of that ſubſtance, has ever been formed except by fuſion. If by any art this ſubſtance ſhall be diſſolved in ſimple water, or *made to cryſtallize from any ſolution*, in that caſe the aſſertion which has been here made may be denied."

35
Probably diſſolved by an alkali in the fountain of Geyſer.

36 Bodies penetrated by flinty matter in fuſion.

37 Exemplified in chalk;

But beſides this proof he adduces another, ſuppoſed to be more direct; and that is, the penetration of many bodies with a flinty ſubſtance, which, according to every collateral circumſtance, muſt have been performed by the flinty matter in a ſtate of ſimple fuſion, and not in a ſtate of ſuſpenſion by any ſolvent. Flinty bodies are found perfectly inſulated in ſtrata of chalk and ſand: and here our author determines that it is *not poſſible* that flint matter could be conveyed into the middle of theſe ſtrata by a menſtruum in which it was diſſolved, and thus depoſited in that place, without the ſmalleſt trace of depoſition in the neighbouring parts. The form of theſe bodies alſo demonſtrates, in his opinion, "1. That they have been introduced among thoſe ſtrata in a fluid ſtate, by injection from ſome other place; 2. That they have been diſperſed in a variety of ways among thoſe ſtrata then deeply immerſed at the bottom of the ſea; and, 3. That they have been there congealed from the ſtate of fuſion, and have remained in that ſituation, while thoſe ſtrata have been removed from the bottom of the ocean to the ſurface of the preſent land."

38 In petrified wood.

There are alſo ſpecimens brought from many different places, which contain in themſelves *the moſt evident marks of this injection of the flinty ſubſtance in a fluid ſtate*: and theſe are pieces of *foſſile wood* brought from England, Germany, and Loch Neagh in Ireland. Sometimes thoſe ſpecimens appear to have been previouſly penetrated by an irony or calcareous matter, and ſometimes not: "the injected flint, however (ſays he), appears to have penetrated the body of this wood immerſed at the bottom of the ſea, under an immenſe compreſſion of water. This appears from the wood being penetrated partially, ſome parts not being penetrated at all. Now, in the limits betwixt theſe two parts, we have the moſt convincing proofs that it had been flint in a ſimple fluid ſtate which had penetrated the wood, and not in a ſtate of ſolution.

39 Why the wood has not been penetrated by flint in a ſtate of ſolution.

"*Firſt*, Becauſe, however little of the wood is left unpenetrated, the diviſion is always diſtinct between the injected part and that which is not penetrated by the fluid flint. In this caſe the flinty matter has proceeded a certain length, which is marked, and no farther; and beyond this boundary there is no partial impregnation, nor a gradation of the flintifying operation, as there muſt have been if ſiliceous matter had been depoſited from a ſolution. *2dly*, The termination of the flinty impregnation has aſſumed ſuch a form preciſely as would have happened naturally from a fluid flint penetrating that body.

"In other ſpecimens of this mineralizing operation, foſſile wood, penetrated more or leſs with ferruginous or calcareous ſubſtance, has been afterwards penetrated with a flinty ſubſtance. In this caſe, with whatever different ſubſtances the woody body ſhall be ſuppoſed to have been penetrated in a ſtate of ſolution by water, the regular ſtructure of the plant would ſtill have remained, with its vacuities variouſly filled with the petrifying ſubſtances, ſeparated from the aqueous menſtruum, and depoſited in the vaſcular ſtructure of the wood.

"There cannot be a doubt with regard to the truth of this propoſition; for, as it is, we frequently find parts of the conſolidated wood with the vaſcular ſtructure remaining perfectly in its natural ſhape and ſituation; but if it had been by aqueous ſolution that the wood had been penetrated and conſolidated, all the parts of that body would be found in the ſame natural ſhape and ſituation.

"This, however, is far from being the caſe; for while in ſome parts the vaſcular ſtructure is preſerved entire, it is alſo evident, that in general the woody ſtructure is variouſly broken and diſſolved by the fuſion and cryſtallization of the flint."

40 Of the ſulphureous ſubſtances.

With regard to the ſecond kind of ſubſtances to be conſidered, and which are called by our author *ſulphureous*, he tells us, "that they are not ſoluble in water ſo far as we know, but fuſible by heat, and inflammable by means of heat and vital air. They are either more ſimple or more compound. The former conſiſt of phlogiſton united either with acid or metallic ſubſtances, the one forming ſulphur, properly ſo called, the other metals. The more compound kind are compoſed of oily matter produced by vegetables, and forming bituminous ſubſtances.

41 Metals cannot be mineralized by aqueous ſolution.

"Sulphur is found naturally combined with metals, which are ſaid to be mineralized by it; and it is well known that this mineralization is performed by means of heat and fuſion; nor will any perſon ſkilled in chemiſtry pretend to ſay that this is done in the way of aqueous ſolution. The combination of iron and ſulphur, for inſtance, may be eaſily performed by fuſion; but this compound is reſolved into a vitriolic ſalt by aqueous ſolution."

42 Exemplified in different ſubſtances.

Our author further remarks, that unleſs all the ſubſtances of this kind were ſoluble in water, we ought not to ſay that any one of them is formed by aqueous ſolution; for there is ſuch a continued chain of connection between them, that all muſt have been formed either by aqueous ſolution or by means of heat and fuſion. In one maſs, for inſtance, we find, 1. Pyrites, containing ſulphur, iron, and copper: 2. Blend, conſiſting of iron, ſulphur, and calamine: 3. Galena, conſiſting of lead and ſulphur: 4. Marmor metallicum, conſiſting of terra ponderoſa ſaturated with the vitriolic acid, a ſubſtance inſoluble in water: 5. A ſaturation of calcareous earth with the acid of fluor, forming a ſubſtance likewiſe inſoluble in water: 6. Calcareous ſpar of different kinds, being calcareous earth ſaturated with fixed air, and ſomething alſo which makes a variety: And, laſtly, Siliceous ſubſtance, or quartz cryſtals. Unleſs, therefore, every one of theſe different ſubſtances were ſoluble in water, and cryſtallizable from it, we will look in vain for any explanation of theſe appearances by means of aqueous ſolution; while heat being capable of rendering all theſe ſubſtances fluid, they may be with the greateſt ſimplicity tranſported from one place to another; and they may be made to concrete altogether at the ſame time, and diſtinctly ſeparate in any place.

43 Suppoſed proof from an Hungarian mineral.

But what puts the matter beyond all doubt with our author, is a ſpecimen of ore taken from an Hungarian mine, and which contains petro-ſilex, pyrites, and cinnabar, ſo mixed together and cryſtallized upon one another, that it is impoſſible to conceive any one of theſe bodies to have had its fluidity and concretion from a cauſe which had not affected the other two. "Now (ſays our author), let thoſe who would deny the fuſion of this ſiliceous body explain how water could diſſolve theſe three different bodies, and depoſit them in their preſent ſhape. If, on the contrary, they have not the leaſt ſhadow of reaſon for ſuch a gratuitous ſuppoſition, the preſent argument muſt be admitted in its full force."

44
From the exiſtence of native metals in the earth.

The next argument in favour of our author's doctrine is drawn from the exiſtence of metallic bodies in their malleable ſtate in the bowels of the earth. In this ſituation they are alſo commonly attended with ſuch evident marks of fuſion, that it is impoſſible to deny their having been really melted; and for the truth of this he appeals, among a thouſand inſtances, to the great native maſs of iron found by Dr Pallas in Siberia.

45
Of bituminous bodies.

46
Why theſe bodies are not altered by heat while under water.

47
Proof that bituminous ſubſtances have been conſolidated by heat.

Oily or bituminous bodies are found variouſly intermixed with mineral ſubſtances, as well as forming diſtinct ſtrata of themſelves. Vegetables afford oily and reſinous matters; which being collected at the bottom of the ocean are there formed into ſtrata, afterwards changed by various degrees of heat, and the evaporation of their more fluid parts. "In order to underſtand this (ſays our author), it muſt be conſidered, that, while immerſed in water, and under inſuperable compreſſion, the vegetable, oily, and reſinous ſubſtances would appear to be unalterable by heat; and it is only in proportion as certain chemical ſeparations take place, that thoſe inflammable bodies are changed in their ſubſtance by the application of heat. Now, the moſt general change of this kind is by evaporation, or the diſtillation of their more volatile parts; by which oily ſubſtances become bituminous, and bituminous ſubſtances become coaly. There is here a gradation, which is beſt underſtood by comparing the two extremes. On the one hand, we know by experiment, that oily and bituminous ſubſtances can be melted, and partly changed into vapour by heat; and that they become harder and denſer in proportion as the more volatile parts have evaporated from them. On the other hand, coaly ſubſtances are deſtitute of fuſibility and volatility, in proportion as they have been expoſed to greater degrees of heat, and to other circumſtances favourable to the diſſipation of their more volatile and fluid parts. If, therefore, in mineral bodies we find the two extreme ſtates of this combuſtible ſubſtance, and alſo the intermediate ſtates, we muſt either conclude that this particular operation of heat has been thus actually employed in nature, or we muſt explain thoſe appearances by ſome other means in as ſatisfactory a manner, and ſo as ſhall be conſiſtent with other appearances. In this caſe it will avail nothing to have recourſe to the falſe analogy of water diſſolving and cryſtallizing ſalts, which has been ſo much employed for the explanation of other mineral appearances. The operation here in queſtion is of a different nature, and neceſſarily requires both the powers of heat and proper conditions for evaporation. Therefore, in order to decide the point with regard to what is the power in nature, by which mineral bodies have become ſolid, we have only to find a bituminous ſubſtance in the moſt complete ſtate of coal, intimately connected with ſome other ſubſtance which is more generally found conſolidating the ſtrata, and aſſiſting in the concretion of mineral ſubſtances. A moſt undoubted proof of this kind our author has in his poſſeſſion, viz. a maſs in which are blended together coal of the moſt fixed kind, quartz, and marmor metallicum. The ſpecimen alſo is contained in a rock, which every naturaliſt, he ſays, will allow to have been produced by fire and fuſion.

48
Formation of the different kinds of coal.

49
Stratum containing liquid bituminous matter in Fifeſhire.

The ſtrata of foſſil coal are found in almoſt every intermediate ſtate, as well as in thoſe of bitumen and charcoal. Of the former kind is that foſſil coal which melts and becomes fluid by heat; of the latter, is that ſpecies found both in Wales and Scotland, which is perfectly infuſible in the fire, and burns like coaks without flame or ſmoke. The former abounds in oily matter; the latter has been diſtilled by heat until it has become a *caput mortuum*, or perfect coal. The more volatile parts of theſe bodies are ſometimes found in their ſeparate ſtate. Thus at Raith in Fifeſhire, there is a ſtratum of limeſtone, which, though but ſlightly tinged with a black colour, contains bituminous matter like pitch, in many cavities which are lined with calcareous ſpar cryſtallized. Now, it is to be obſerved, that had the cavity in the ſolid limeſtone or marble, which is lined with calcareous cryſtals containing pyrites, been thus incruſted by means of filtration with water, this water muſt have diſſolved calcareous ſpar, pyrites, and bitumen. But theſe natural appearances would not even be ſolved by this hypotheſis of diſſolution and filtration of theſe ſubſtances. There is alſo required, firſt, a cauſe for the ſeparation of theſe different ſubſtances from the aqueous menſtruum. 2. An explanation of the way in which a bitumen ſhould be formed into hard round bodies (our author has a ſpecimen of this kind) of the moſt ſolid ſtructure; and, laſtly, ſome probable means for this complicated operation being performed below the bottom of the ocean, in the cloſe cavity of a marble ſtratum.

50
On the production of foſſile ſalt by fuſion.

Having thus run through his courſe of argument for the probability of the ſtrata of earth being formed by heat and fuſion rather than by aqueous ſolution, our author proceeds to the examination of a phenomenon in the mineral kingdom, which may be thought inconſiſtent with what he has advanced; viz. the exiſtence of great maſſes of ſalt in the bowels of the earth. On this ſubject he obſerves, that the formation of maſſes of ſalt at the bottom of the ſea, without the aſſiſtance of ſubterraneous fire, is not a thing unſuppoſeable as at firſt ſight might appear. "Let us but ſuppoſe a rock placed acroſs the gut of Gibraltar (a caſe nowiſe unnatural), and the bottom of the Mediterranean would be certainly filled with ſalt; becauſe the evaporation from the ſurface of that ſea exceeds the meaſure of its ſupply. But ſtrata of ſalt formed in this manner at the bottom of the ſea are as far from being conſolidated by means of aqueous ſolution as a bed of ſand in the ſame ſituation; and we cannot ſuppoſe the conſolidation of ſuch a ſtratum of ſalt by means of water, without ſuppoſing ſubterranean heat employed to evaporate the brine which would ſucceſſively occupy the interſtices of the ſaline cryſtals. But this, it may be obſerved, is equally departing from the natural operation of water as the means for conſolidating the ſediment of the ocean, as if we were to ſuppoſe the ſame thing done by heat and fuſion. For the queſtion is not, if ſubterranean heat be of ſufficient intenſity for the purpoſe of conſolidating ſtrata by the fuſion of their ſubſtances? but, whether it be by means of this agent, ſubterraneous heat, or by water alone, without the operation of a melting heat, that thoſe materials have been variouſly conſolidated?"

51 From the appearance of the ſalt-rock in Cheſhire.

The Doctor now attempts to prove, from the appearance of the ſaline ſtrata, that they have been formed by ſubterraneous heat and fuſion as well as the others. "The ſalt-rock in Cheſhire lies in ſtrata of red marl. It is horizontal in its direction, and is dug 30 or 40 feet deep. The body of this rock is perfectly ſolid, and the ſalt in many places pure, colourleſs, and tranſparent, breaking with a ſparry, cubical texture: but the greateſt part is tinged by the admixture of the marl, and that in various degrees, from the ſlighteſt tinge of red to the moſt perfect opacity. Thus the rock appears as if it had been a maſs of fluid ſalt, in which had been floating a quantity of marly ſubſtance not uniformly mixed, but every where ſeparating and ſubſiding from the ſaline ſubſtance. There is alſo to be obſerved a certain regularity in the ſeparation of the tinging from the colourleſs ſubſtance; which, at a proper diſtance, gives to the perpendicular ſection of the rock a diſtinguiſhable figure in its ſtructure. When looking at this appearance near the bottom of the rock, it firſt preſented the figure of regular ſtratification; but upon examining the whole maſs of rock, this ſtratification was found only to take place near the bottom. At the top of the rock, the moſt beautiful figure, though the moſt diſtant from ſtratification, was obſerved. It was all compoſed of concentric circles, and theſe appeared to be the ſection of a maſs made up entirely of concentric ſpheres, like thoſe beautiful ſyſtems of configuration which agates ſo frequently preſent us with in miniature. In about eight or ten feet from the top, the circles growing large, were blended together, and gradually loſt their regular appearance, until at a greater depth they again aſſumed that of a regular ſtratification. This regular arrangement of the floating marly ſubſtance in the body of the ſalt, which is that of the ſtructure of a coated pebble, or that of concentric ſpheres, is altogether inexplicable upon any other ſuppoſition than the perfect fluidity or fuſion of the ſalt, and the attractions and repulſions of the contained ſubſtances. It is in vain to look in the operations of ſolution and evaporation for that which nothing but perfect fluidity and fuſion can explain.

52 From the mineral alkali on Teneriff.

"This example of a mineral ſalt congealed from a melted ſtate, may be confirmed by another argument ſuggeſted by Dr Black, *viz.* an alkaline ſalt found in a mineral ſtate, and deſcribed in the Philoſoph. Tranſac. for 1771. The foſſile alkali cryſtallizes from a diſſolved ſtate, in combining itſelf with a large quantity of water, in the manner of alum: and in this caſe the water is eſſential to the conſtitution of that ſolid cryſtalline body; for, upon the evaporation of the water, the tranſparent ſalt loſes its ſolidity, and becomes a white powder. If, inſtead of being gently dried, the cryſtalline ſalt is ſuddenly expoſed to a ſufficient degree of heat (that is, ſomewhat more than the heat of boiling water), it enters into the ſtate of aqueous fuſion, and boils, emitting the water by means of which it had been cryſtallized in the cold, and rendered fluid in that heated ſtate. It cannot be cryſtallized from a diſſolved ſtate without the combination of that quantity of water; nor can that water be ſeparated without deſtroying its cryſtalline ſtate. But in this mineral ſpecimen we have a ſolid cryſtalline ſalt, with a ſtructure which, upon examination, appears to be ſparry and radiated like the zeolite. It contains no water in its cryſtallization, but melts in a ſufficient heat without any aqueous fuſion. Therefore this ſalt muſt have been in a fluid ſtate of fuſion immediately before its congelation and cryſtallization.

53 From iron-ſtone.

"Another example may be drawn from the iron-ſtone, which is commonly found among the argillaceous ſtrata attendant upon foſſile coal, both in Scotland and England. This ſtone is generally found among the bituminous ſchiſtus or black argillaceous ſtrata, either in ſeparate maſſes of various ſhapes and ſizes, or forming of itſelf ſtrata which are more or leſs continuous in their direction among the ſchiſtus or argillaceous beds. This mineral contains in general from 40 to 50 *per cent.* of iron, and it loſes near one-third of its weight in calcination. Before calcination it is of a grey colour, is not penetrable by water, and takes a poliſh. In this ſtate therefore it is perfectly ſolid; but being calcined, it becomes porous, red, and tender. The fact to be proved with regard to theſe iron ſtones is, that they have acquired their ſolid ſtate from fuſion, and not in concreting from any aqueous ſolution. A ſpecies of this kind of ſtone is found at Aberlady in Eaſt Lothian, reſembling an oblate or much compreſſed ſphere, and the ſize from two or three inches diameter to more than a foot. In the circular or horizontal ſection they preſent the moſt elegant ſeptarium: and from the examination of this particular ſtructure, the following concluſions may be drawn.

54 Suppoſed to have received its form by fuſion.

"1. That the ſepta have been formed by the uniform contraction of the internal parts of the ſtone, the volume of the central parts diminiſhing more than that of the circumference; by which means the ſeparations of the ſtone diminiſh in a progreſſion from the centre towards the circumference.

"2. There are only two ways in which the ſepta muſt have received the ſpar with which they are filled more or leſs; either, firſt, by inſinuation into the cavity of theſe ſepta after they were formed; or, ſecondly, by ſeparation from the ſubſtance of the ſtone at the ſame time that the ſepta were forming.

55 The ſepta of this ſtone could not have been filled by aqueous ſolution.

"Were the former of theſe ſuppoſitions true, appearances would be obſervable, ſhowing that the ſparry ſubſtance had been admitted either through the porous ſtructure of the ſtone, or through proper apertures communicating from without. Now, if either of theſe had been the caſe, and the ſtone had been conſolidated from no other cauſe than concretion from a diſſolved ſtate, that particular ſtructure of the ſtone by means of which the ſpar had been admitted muſt appear at preſent upon an accurate examination. This, however, is not the caſe; and we might reſt the argument here: The ſepta reach not the circumference; the ſurface of the ſtone is ſolid and uniform in every part; and there is not any appearance of the ſpar in the argillaceous earth around the ſtone. It therefore neceſſarily follows, that the contraction of the iron-ſtone, in order to form the ſepta, and the filling the cavities with ſpar, had proceeded *pari paſſu*; and that this operation muſt have been brought about by means of fuſion or by congelation from a ſtate of ſimple fluidity and expanſion.

"There is one fact more, which is well worth our attention; *viz.* the cryſtallizations which are found in

56 Of cryſtallizations in cavities of ſolid bodies.

57 Particular kind of druſen deſcribed.

cloſe cavities of the moſt ſolid bodies. Theſe concretions are well known to naturaliſts, and form part of the beautiful ſpecimens which are to be found in the cabinets of collectors, and which the German mineraliſts have named *druſen*." Our author, however, conſiders only one of theſe ſpecies, which is of the agate kind. It belongs to the kind of ſtones frequent in this country, which are commonly called *pebbles*. Many of them are filled with a ſiliceous cryſtallization, which evidently proceeds from the circumference towards the centre. Many of them again are hollow. They are uniformly lined with cryſtallized ſubſtances; and it is proper to attend to this circumſtance, that the cavity is perfectly incloſed with many ſolid coats impervious to air or water; but particularly with the external cortical part, which is extremely hard, takes the higheſt poliſh, and is of the moſt perfect ſolidity, admitting nothing but the paſſage of light and heat.

58 Other mineral cryſtallizations deſcribed.

"Within theſe cavities we find, firſt, the coats of cryſtals with which this cavity is always lined: and this is general to all ſubſtances concreting in ſimilar circumſtances from a ſtate of fuſion; for when thus at liberty they naturally cryſtallize. 2. We have frequently a ſubſequent cryſtallization ſet upon the firſt, and more or leſs immerſed in it. 3. There is alſo ſometimes a third cryſtallization ſuperincumbent on the ſecond, in like manner as the ſecond was upon the firſt. Our author has one ſpecimen in which the primary cryſtals are ſiliceous; the ſecond thin foliaceous cryſtals of deep red but tranſparent ore, forming elegant figures that have the form of roſes; the tertiary cryſtallization is a froſting of ſmall ſiliceous cryſtals upon the edges of the foliaceous cryſtals. In other ſpecimens there is firſt a lining of colourleſs ſiliceous cryſtals, then another lining of amethyſtine cryſtals, and ſometimes within that fuliginous cryſtals. Upon theſe fuliginous and amethyſtine cryſtals are many ſphericles or hemiſpheres of red compact iron-ore like hæmatites. In others again, the primary cryſtals are ſiliceous, and the ſecondary calcareous. Of this kind there is one in the Doctor's poſſeſſion, which has upon the calcareous cryſtals beautiful tranſparent ſiliceous cryſtals, and iron ſphericles upon theſe. He has alſo an agate formed of various red and white coats, and beautifully figured. The cavity within the coated part of the pebble is filled up without vacuity; firſt with colourleſs ſiliceous cryſtals; ſecondly, with fuliginous cryſtals; and, thirdly, with white or colourleſs calcareous ſpar. But between the ſpar and cryſtals there are many ſphericles, ſeemingly of iron, half ſunk into each of theſe two different ſubſtances."

From the foregoing facts our author now draws the following concluſions.

59 Concluſions concerning the fuſed ſtate of the minerals.

"1. That concretion had proceeded from the ſurface of the agate inwards. This neceſſarily follows from the nature of thoſe figured bodies, the figures of the external coats always determining the ſhape of thoſe within, and never contrariwiſe, thoſe within affecting thoſe without.

"2. That when the agate was formed, the cavity then contained every thing which is now found in it, and nothing more.

"3. That the contained ſubſtances muſt have been in a fluid ſtate, in order to their cryſtallizing.

"4. That as this fluid ſtate had not been the effect of ſolution in a menſtruum, it muſt have been fluidity from heat and fuſion."

60 The doctrine of fuſion applied to the formation of the ſtrata.

This is the ſubſtance of all the evidence brought by Dr Hutton in ſupport of his doctrine, that moſt of the mineral ſubſtances with which the ſtrata are conjoined muſt have been produced by ſubterraneous heat, and not from any aqueous ſolution. Thus far he thinks it is perfectly concluſive, though not altogether ſo with regard to the formation of the ſtrata themſelves: but, in order to make it apply alſo to theſe, he next propoſes to give examples of ſtrata conſolidated without the introduction of foreign matter, merely by the ſoftening or fuſion of their own materials.

61 Univerſal prevalence of the calcareous and ſiliceous ſtrata.

For this purpoſe he conſiders the calcareous and ſiliceous ſtrata, which are the two ſo much prevalent on the ſurface of the globe, that all others, according to him, may be conſidered as nothing: "for (ſays he) unleſs it be the bituminous or coal ſtrata, there is hardly any other which does not contain more or leſs of one or other of theſe two ſubſtances. If therefore it can be ſhown, that both of theſe two general ſtrata have been conſolidated by the ſimple fuſion of their ſubſtance, no deſideratum or doubt will remain with regard to the nature of that operation which has been tranſacted at great depths of the earth, places to which all acceſs is denied to mortal eyes.

"We are now to prove, 1. That thoſe ſtrata have been conſolidated by ſimple fuſion; and, 2. That this operation is univerſal in relation to the ſtrata of the earth, as having produced the various degrees of hardneſs or ſolidity in theſe bodies.

62 Conſolidation of a ſtratum from a fortuitous collection of hard bodies.

"I ſhall firſt remark, that a fortuitous collection of hard bodies, ſuch as gravel and ſand, can only touch in points, and cannot while in that hard ſtate be made to correſpond ſo preciſely to each other's ſhape as to conſolidate the maſs. But if theſe hard bodies ſhould be ſoftened in their ſubſtance, or brought into a certain degree of fuſion, they might be adapted mutually to each other; and thus conſolidate the open ſtructure of the maſs. Therefore, to prove the preſent point, we have but to exhibit ſpecimens of ſiliceous and calcareous ſtrata which have been evidently conſolidated in this manner. Of the firſt kind great varieties occur in this country. They are the conſolidated ſtrata of gravel and ſand, often containing abundance of feldtſpar, and thus graduating into granite; a body, in this reſpect, perfectly ſimilar to the more regular ſtrata which we now examine. The ſecond kind again are leſs common, unleſs we conſider the ſhells and coralline bodies of our limeſtones as exhibiting the ſame example, which indeed they do. But I have a ſpecimen of marble from Spain which will afford the moſt ſatisfactory evidence of the fact in queſtion.

63 Spaniſh marble deſcribed.

This Spaniſh marble may be conſidered as a ſpecies of pudding-ſtone; a ſpecies of marble which, from Mr Bowles's Natural Hiſtory, appears to be very common in Spain. The gravel of which this marble is compoſed conſiſts of fragments of other marbles of different kinds. Among theſe are different ſpecies of zeolites, marble, ſome ſhell marbles, and ſome compoſed of a chalky ſubſtance, or of undiſtinguiſhable parts. But it appears that all theſe different marbles had been conſolidated or made hard, then broken into fragments, rolled and worn by attrition; and thus collected together, along with ſome ſand or ſmall ſiliceous bodies, into one maſs. Laſtly, this compound body is conſolidated in ſuch a manner as to give the moſt diſtinct evidence that this had been executed by the heat of ſimple fuſion.

64
Proof of this having been in a ſtate of fuſion.

“ The proof is, that, beſides the general conformation of thoſe hard bodies, ſo as to be perfectly adapted to each other's ſhape, there is in ſome places a mutual indentation, which reſembles perfectly the junction of the different bones of the cranium; and which muſt neceſſarily have required a mixture of thoſe bodies while in a ſoft or fluid ſtate.

“ This appearance of indentation is by no means ſingular or limited to one particular ſpecimen. I have ſeveral ſpecimens of different marbles, in which fine examples of this ſpecies of mixture may be perceived. But in this particular caſe of the Spaniſh pudding-ſtone, where the mutual indentation is made between two pieces of hard ſtone worn round by attrition, the ſoftening or fuſion of theſe two bodies is not ſimply rendered probable, but demonſtrated.

“ Having thus proved, that thoſe ſtrata had been conſolidated by ſimple fuſion, as propoſed, we now proceed to ſhow, that this mineral operation had been not only general but univerſal, in conſolidating our earth in all the various degrees, from looſe and incoherent ſhells and ſand to the moſt ſolid bodies of the ſiliceous and calcareous ſubſtances.

65
The ſame doctrine exemplified in chalk.

“ To examplify this in the various collections and mixtures of ſands, gravels, ſhells, and corals, were endleſs and ſuperfluous. We ſhall only take for an example one ſimple homogeneous body, in order to exhibit it in the various degrees of conſolidation, from the ſtate of ſimple incoherent earth to that of the moſt ſolid marble. The ſubſtance meant is chalk, naturally a ſoft calcareous earth, but which may be found conſolidated in every different degree.

66
Account of a ridge of indurated chalk running thro' the iſle of Wight.

“ Through the middle of the iſle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the iſle of Wight directly weſt into Dorſetſhire, and goes by Corfcaſtle towards Dorcheſter, perhaps beyond that place. The ſea has broke through this ridge at the weſt end of the iſle of Wight, where columns of the indurated chalk remain, called the *Needles;* the ſame being found on the oppoſite ſhore in Dorſetſhire. In this field of chalk we find every gradation of this ſoft earthy ſubſtance to the moſt conſolidated body of this indurated ridge, which is not ſolid marble, but which has loſt its chalky property, and acquired a kind of ſtony hardneſs.

67
Another in Ireland.

“ We have this cretaceous ſubſtance in its moſt indurated and conſolidated ſtate in the kingdom of Ireland, not far from the Giant's Cauſeway; and it affords the moſt perfect evidence of this body having been once a maſs of chalk, which is now a body of ſolid marble. Thus, if it is by means of fuſion that the ſtrata of the earth have in many places been conſolidated, we muſt conclude that all the degrees of conſolidation, which are indefinite, have been brought about by the ſame means.

68
Granite alſo conſolidated by fuſion.

“ It may, however, ſtill be alleged, that there is a great part of the ſolid maſs of this earth not properly comprehended among thoſe bodies which have been thus proved to be conſolidated by means of fuſion. This is granite; a maſs which is not generally ſtratified, and which being a body perfectly ſolid, and forming ſome parts in the ſtructure of this earth, deſerves to be conſidered. The nature of the granite is too intricate a ſubject to be here conſidered: we ſhall therefore only now take notice of one ſpecies; and if this appears to have been once in a ſtate of fuſion, we muſt conclude that all the reſt have been ſo too. The ſpecies in queſtion comes from Portſoy, on the road to Huntley; and is partly a porphyry and partly a granite. The ſingularity of it, however, conſiſts not in the nature or proportions of its conſtituent parts, but in the uniformity of the ſparry ground, and the regular ſhape of the quartz mixture. This ſiliceous ſubſtance, viewed in one direction, or longitudinally, may be conſidered as columnar, priſmatical, or continued in lines running nearly parallel. Theſe columnar bodies of quartz are beautifully impreſſed with a figure on the ſides, where they are in contact with the ſpar. This figure is that of furrows or channels, which are perfectly parallel, and run acroſs the longitudinal direction of the quartz. This ſtriated figure is only ſeen when, by fracture, the quartz is ſeparated from the contiguous ſpar. But what is more particularly to be noticed is, that the tranſverſe ſection of thoſe longitudinal bodies not only have ſeparately the forms of certain typographical characters, but collectively give the regular linear appearance of types ſet in writing.

69
Deſcription of a ſpecies from Portſoy.

“ It is evident from the inſpection of this foſſil, that the ſparry and ſiliceous ſubſtances had been mixed together in a fluid ſtate; and that the cryſtallization of the ſparry ſubſtance, which had been rhombic, had determined the regular ſtructure of the quartz, at leaſt in ſome directions. Thus the ſiliceous ſubſtance is to be conſidered as included in the ſpar, and as figured according to the laws of cryſtallization proper to the ſparry ground; but the ſpar is alſo to be found included in the quartz. Now it is not poſſible to conceive any other way in which theſe two ſubſtances, quartz and feldt-ſpar, could be thus concreted, except by congelation from a fluid ſtate, in which they had been mixed.”

70
Veins of the ſtrata numerous in proportion to their conſolidation.

Our author having at length finiſhed his arguments on the formation of the ſtrata, draws the following general concluſion. “ If it be by means of heat and fuſion that ſtrata have been conſolidated, then, in proportion to the degree of conſolidation they have undergone from their original ſtate, they ſhould, *cæteris paribus*, abound with more ſeparations in their maſs. But this concluſion is not found conſiſtent with appearances. A ſtratum of ſand-ſtone does not abound ſo much with cutters or veins as a ſimilar ſtratum of marble, or even a ſimilar ſtratum of ſand-ſtone that is more conſolidated. In proportion therefore as ſtrata have been conſolidated, they are in general interſected with veins and cutters; and in proportion as ſtrata are deep in their perpendicular ſection, the veins are wide, and placed at greater diſtances. In like manner, when ſtrata are thin, the veins are many, but proportionally narrow.

71
Strata compoſed of the fragments of others.

“ It is thus upon chemical principles to be demonſtrated, that all the ſolid ſtrata of the globe have been condenſed by means of heat and hardened from a ſtate of fuſion. But this propoſition is equally to be maintained from propoſitions that are mechanical. The ſtrata of the globe, beſides being formed of earths, are compoſed of gravel, ſand, and fragments of hard bodies;

dies; all of which may be conſidered as in their nature ſimple: but theſe ſtrata are alſo found compoſed of bodies which are not ſimple, but are fragments of former ſtrata which had been conſolidated, and afterwards were broken and worn by attrition ſo as to make gravel. Strata compoſed in this manner have been again conſolidated; and now the queſtion is, By what means?

72
Could not be conſolidated by aqueous diſſolution.

"If ſtrata compoſed of ſuch various bodies had been conſolidated, by any manner of concretion, from the fluidity of a diſſolution, the hard and ſolid bodies muſt be found in their entire ſtate, while the interſtices between thoſe conſtituent parts of the ſtratum are filled up. No partial fracture can be conceived as introduced into the middle of a ſolid maſs of hard matter without having been communicated from the ſurrounding parts. But ſuch partial ſeparations are found in the middle of thoſe hard and ſolid maſſes; therefore this compound body muſt have been conſolidated by other means than that of concretion from a ſtate of ſolution.

73
Muſt have undergone a fuſion by fire.

"The Spaniſh marble already deſcribed, as well as many conſolidated ſtrata of ſiliceous gravel, afford the cleareſt evidence of this fact. Theſe hard bodies are perfectly united together in forming the moſt ſolid maſs; the contiguous parts of ſome of the rounded fragments are interlaced together, as has already been obſerved; and there are partial ſhrinkings of the maſs forming veins traverſing ſeveral fragments, but perfectly filled with the ſparry ſubſtance of the maſs, and ſometimes with parts of the ſtone diſtinctly floating on the tranſparent body of the ſpar. Now there is not in nature any known power, beſides heat and fuſion, by which theſe effects might be produced. But ſuch effects are general to all conſolidated maſſes, although not always ſo well illuſtrated in a cabinet ſpecimen."

74
How the ſtrata have been elevated from the bottom of the ocean.

Thus the formation of the ſtrata is ſuppoſed to be fully diſcuſſed: after which our author goes on to conſider the means by which they have been elevated from the bottom of the ocean; for he looks upon it as an undoubted fact, that the higheſt points of our land have been for ages at the bottom of the ocean. "It is a truth unqueſtionable (ſays he), that what had been originally at the bottom of the ſea, is at preſent the higheſt of our land. In explaining this appearance, therefore, no other alternative is left, but either to ſuppoſe ſtrata elevated by the power of heat above the level of the preſent ſea, or the ſurface of the ocean reduced many miles below the height at which it had ſubſiſted during the collection and induration of the land which we inhabit. Now if, on the one hand, we are to ſuppoſe no general power of ſubterraneous fire or heat, we leave to our theory no means for the retreat of the ſea or the lowering of its ſurface. If, on the other, we are to allow the general power of ſubterraneous heat, we cannot have much difficulty in ſuppoſing either the ſurface of the ſea to have ſubſided, or the bottom of the ocean in certain parts to have been raiſed by a ſubterranean power above the level of its ſurface, according as appearances ſhall be found to require the one or the other of theſe concluſions.

"The ſtrata formed at the bottom of the ocean are neceſſarily horizontal in their poſition, or nearly ſo; and continuous in their horizontal direction and extent. They may change, and gradually aſſume the nature of each other ſo far as concerns the materials of which they are formed; but there cannot be any ſudden change, fracture, or diſplacement naturally in the body of a ſtratum. But if theſe ſtrata are cemented by the heat of fuſion, and erected with an expanſive force acting below, we may expect to find every ſpecies of fracture, diſlocation, and contortion in thoſe bodies, and every degree of departure from a horizontal towards a vertical poſition. The ſtrata of the globe are actually found in every poſſible poſition: for from horizontal, they are frequently found vertical; from continuous, they are broken and ſeparated in every poſſible direction; and from a plane, they are bent and doubled. It is impoſſible they could have been formed by the known laws of nature in their preſent ſtate and poſition. And here the apparent irregularity and diſorder of the mineral regions are as inſtructive, with regard to what had been tranſacted in a former period of time, as the order and regularity of theſe ſame regions are concluſive in relation to the place in which a former ſtate of things had produced that which, in its changed ſtate, we now perceive.

75
Strata found broken and diſjoined in every poſſible poſition.

76
Have been raiſed by the force of fire.

"We are now to conclude, that the land on which we dwell had been elevated from a lower ſituation by the ſame agent which had been employed in conſolidating the ſtrata, in giving them ſtability, and preparing them for the purpoſe of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. If this has been the caſe, it will be reaſonable to expect that ſome of the expanded matter might be found condenſed in the bodies which have been heated by that igneous vapour, and that matter foreign to the ſtrata may have been thus introduced into the fractures and ſeparations of thoſe indurated maſſes. We have but to open our eyes to be convinced of this truth. Look into the ſources of our mineral treaſures; aſk the miner from whence has come the metal into his vein? Not from the earth or air above; not from the ſtrata which the vein traverſes. There is but one place from whence theſe minerals may have come; and that is, the bowels of the earth; the place of power and expanſion; the place from whence muſt have proceeded that intenſe heat by which looſe materials have been conſolidated into rocks, as well as that enormous force by which the regular ſtrata have been broken and diſplaced."

77
Proved from the inſpection of mines.

78
A great mechanical power requiſite to fill the veins with the matter they contain.

Our author is of opinion, that this action of heat is likewiſe evident from an inſpection of the materials with which the veins are filled, as well as their various fractures and irregularities; and informs us, that ſome great mechanical power muſt have been employed in filling theſe veins, as well as that neceſſarily employed in making the firſt fracture and divulſion. The ſucceſſive irruptions of fluid ſubſtances into the veins, he ſays, is *demonſtrable* from the mere inſpection of the veins and their contents, it being very common to ſee three ſucceſſive ſeries of theſe operations; "all which may be perceived in a ſmall fragment of a ſtone, which a man of ſcience may examine in his cloſet, often better than by deſcending to the mine where all the examples are found on a large ſcale."

79
Succeſſive irruptions of fluid matter into them.

Theſe fiery operations, he contends, are not to be accounted any way accidental, but as entirely natural to the globe, and remain at this day with undiminiſhed force: and of this he brings a proof from the erup-

80 Sicilian jaſper once in a ſtate of fuſion.

tions of mount Ætna, informing us, that he has in his poſſeſſion a table of Sicilian jaſper, which evidently ſhows that this calcareous ſtone had flowed and been in ſuch a ſtate of fuſion as lava is.

81 Heat of volcanoes the renovating power of the earth.

This ſubterraneous heat manifeſted in the burning mountains is the renovating power which the earth poſſeſſes within itſelf, and which prevents it from coming to an end by reaſon of the perpetual waſte taken notice of n° 22. "Volcanoes (ſays he) are natural to the globe as general operations; but we are not to conſider nature as having a burning mountain for an end in her intention, or as a principal purpoſe in the general ſyſtem of this world. The end of nature in placing an internal fire or power of heat, and a force of irreſiſtible expanſion in the body of this earth, is to conſolidate the ſediment collected at the bottom of the ſea, and to form thereof a maſs of permanent land above the level of the ocean, for the purpoſe of maintaining plants and animals. The power appointed for this purpoſe is, as on all other occaſions where the operation is important, and where there is any danger of a ſhortcoming, wiſely provided in abundance; and there are contrived means for diſpoſing of the redundancy. Theſe, in the preſent caſe, are our volcanoes.

82 Volcanoes to be conſidered as ſpiracles to the ſubterraneous heat.

"A volcano is not made on purpoſe to frighten ſuperſtitious people into fits of piety and devotion, nor to overwhelm devoted cities with deſtruction: A volcano ſhould be conſidered as a ſpiracle to the ſubterraneous furnace, in order to prevent the unneceſſary elevation of land and fatal effects of earthquakes; and we may reſt aſſured, that they in general wiſely anſwer the end of their intention, without being in themſelves an end for which nature had exerted ſuch amazing power and contrivance."

83 Are only proper for elevating land from the bottom of the ſea.

The Doctor then goes on to ſhow, that volcanoes are not proper for elevating land, unleſs placed at the bottom of the ſea, where the contact of the water tends to cloſe the orifice, and to accumulate matter upon the weakeſt part. An inſtance of this was given in the year 1707, when the burning iſland aroſe in the Mediterranean; and he confirms his theory by the great number of melted matters which are every where to be found in the ſtrata, even of countries where no

84 Whin-ſtone ſuppoſed to have been in a ſtate of fuſion.

volcanoes exiſt at preſent. Examples are brought from the dykes of whin-ſtone, as they are called in this country, and which he ſuppoſes to have been once in a ſtate of fuſion.

85 Difference between erupted and unerupted lavas.

In order to avoid an objection which might here ariſe from the difference betwixt the appearance of our whinſtone and the lavas of volcanoes, our author makes a diſtinction between ſuch as have been erupted at the moment of exploſion, and thoſe which had been melted under a vaſt compreſſion of weighty materials, and at laſt expoſed to the air after the lpaſe of a number of ages. "In the erupted lavas, thoſe ſubſtances which are ſubject to calcine and vitrify in our fires, ſuffer ſimilar changes when delivered from a compreſ-

86 Ebullition in volcanoes owing to the extrication of fixed air.

ſion which had rendered them fixed, though in an extremely heated ſtate. Thus a lava in which there is much calcareous ſpar, when it comes to be expoſed to the atmoſphere, or delivered from the compreſſing force of its confinement, effervеſces by the exploſion of its fixed air; the calcareous earth at the ſame time vitrifying with the other ſubſtances. Hence ſuch violent ebullition in volcanoes, and hence the emiſſion of ſo much pumice ſtone and aſhes which are of the ſame nature. In the body of our whinſtone, on

87 Compoſition of whin-ſtone deſcribed.

the contrary, there is no mark of calcination or vitrification. We frequently find in it much calcareous ſpar, or the *terra calcarea aerata*, which had been in a melted ſtate by heat, and had been cryſtallized by congelation into a ſparry form. This is the cauſe of the differences between the erupted lavas and our whinſtone, toadſtone, and the Swediſh trap; which may be called *ſubterranean lavas*."

88 Strange account of the origin of metals.

All this time our author ſeems to have excluded from his ſyſtem every idea of accounting for the origin of metals; though this would ſeem to be no leſs neceſſary than to account for that of whinſtone. At laſt, however, we are informed that there are peculiar productions in the mineral kingdom which are rare, as being found only in few places; and of theſe he enumerates the diamond of the eaſt, the platina of the weſt, and the tin of Cornwal, Germany, and Sumatra. "But all theſe ſubſtances (gold itſelf not excepted)," ſays he, "are to be conſidered as the vapours of the mineral regions condenſed occaſionally in the crevices of the land."

89 Syſtem of decay and renovation in the earth.

90 A fourth part of the land ſuppoſed to proceed from marine animals.

The laſt part of our author's diſſertation contains the ſyſtem of decay and renovation obſerved in the earth. In this having again obſerved what had been already repeated over and over, that the land we ſee at preſent had been formed at the bottom of the ſea, he proceeds to inform us, that, "at a groſs computation, there may perhaps be a fourth part of our ſolid land which is compoſed from the matter that had belonged to theſe animals. Now what a multitude of living creatures, what a quantity of animal economy, muſt have been required, for producing a body of calcareous matter which is interſperſed throughout all the land of the globe, and which certainly forms a very conſiderable part of the maſs! Therefore, in knowing how theſe animals had lived, or with what they had been fed, we ſhall have learned a moſt intereſting part of the hiſtory of the earth; a part which it is neceſſary to have aſcertained, in order to ſee the former operations of the globe, while preparing the materials of the preſent land."

91 Gravel, ſand, and clay conſidered.

Before entering upon this ſubject, however, he ſtill thinks it neceſſary to conſider ſome other of the component parts of the ſtrata of our preſent earth. Theſe are gravel, ſand, and clay. Gravel, he tells us, is no other than ſtones worn round by their attrition in water; and finding them in the compoſition of our land, we muſt conclude, that in the former earth there had been operations of wind and water ſimilar to thoſe which we behold at preſent; and by which new gravel is continually prepared, as well as old gravel conſumed or diminiſhed by attrition upon our ſhores. Sand is no other than ſmall particles of hard and ſolid bodies worn round by attrition. Clay is a mixture of different earths or hard ſubſtances in an impalpable ſtate; and theſe ſubſtances are chiefly the ſiliceous and aluminous earths. Others are occaſionally mixed in clays; or perhaps always to be found in ſome ſmall portion. But the great quantity of ſiliceous, argillaceous, and other compound ſubſtances, in form of earth or other impalpable ſediment, correſponds perfectly with that quantity of theſe ſame ſubſtances which muſt have been prepared in the formation of ſo much gravel and ſand, by the attrition of theſe bodies in the moving waters.

92 Conjectures concerning the former earth.

From theſe conſiderations our author tells us, that we have reaſon to conclude there had been in the former earth ſuch operation as we ſee at preſent; and likewiſe that it had been compoſed of ſimilar materials. The animals which had formerly exiſted, alſo appear by their remains to have been ſimilar to what they are now; and it is alſo probable that their food had been derived from the ſame origin, viz. vegetables. There muſt therefore have exiſted in the former earth a world of vegetables, as well as a world of animals and an ocean. The exiſtence of theſe he determines from the many ſpecimens of foſſil wood and petrified plants to be met with; and its profuſion he thinks is evidenced from the quantities of mineral coal: of which he ſays, that "nothing can be more certain than that all the coaly or bituminous ſtrata have had their origin from the ſubſtance of vegetable bodies that grew upon the land."

93 Coal ſuppoſed to have been derived from wood.

94 Of the diminution of our preſent land.

Laſtly, when he comes to ſpeak of the actual diminution of the earth we at preſent inhabit, he proceeds in the following manner: "Our land has two extremities; the tops of the mountains on one hand, and the ſea-ſhore on the other. It is the intermediate ſpace between theſe two that form the habitation of plants and animals. While there is a ſea, ſhore, and a high ground, there is that which is required in the ſyſtem of the world; take theſe away, and there would remain an aqueous globe, in which the world would periſh. But, in the natural operations of the world, the land is periſhing continually; and this is what we now want to underſtand.

"Upon the one extremity of our land there is no increaſe, nor any occaſion of mineral ſubſtance. That place is the mountain top, on which nothing is obſerved but continual decay. The fragments of the mountain are removed in a gradual ſucceſſion from the higheſt ſtation to the loweſt. Being arrived at the ſhore, and having entered the dominion of the waves in which they find perpetual agitation, theſe hard fragments, which had eluded the reſolving powers natural to the ſurface of the earth, are incapable of reſiſting the powers here employed for the deſtruction of the land. By the attrition of one hard body upon another, the moving ſtones and rocky ſhores are mutually impaired; and that ſolid maſs, which of itſelf had potential ſtability againſt the violence of the waves, affords the inſtruments of its own deſtruction, and thus gives occaſion to its actual inſtability."

95 No perceptible progreſs made n the diſſolution of his earth.

Having thus deſcribed very particularly the means by which the deſtruction of the preſent earth is going on, it is natural to inquire what progreſs has been made in the work. But in this neither ancient nor modern hiſtory give any aſſiſtance. The ſtrait between Italy and Sicily he confeſſes to be no wider; the iſthmus of Corinth to be no narrower; nor the rock on which the famous tower of Pharos was erected, either larger or ſmaller than before. The Palus Mæotis in the time of Polybius appeared to be very near filling up, as that hiſtorian informs us; and ſo it continues to appear at this day, without any apparent progreſs having been made in it. In ſhort, the whole of our author's reſearches can produce nothing more than the loſs of a ſmall iſland in the mouth of the harbour of New Carthage, which, Polybius ſays, exiſted in his time; and for which there is now only a rock under water. Our author therefore is obliged at laſt to own, that the quantity of decay in the rocks he ſpeaks of, has either been too ſmall for human obſervation, or, which is more probable, that no accurate meaſurement of the ſubject by which this quantity of decreaſe might be aſcertained had been taken and recorded. "To ſum up the argument, therefore (ſays he), we are certain, that all the coaſts of the preſent continents are waſted by the ſea, and conſtantly wearing away upon the whole; but this operation is ſo extremely ſlow, that we cannot find a meaſure of the quantity in order to form an eſtimate. Therefore the preſent continents of the earth, which we conſider as in a ſtate of perfection, would, in the natural operations of the globe, require a ſpace indefinite for their deſtruction. But in order to produce the preſent continents, the deſtruction of a former vegetable world was neceſſary; conſequently the production of our preſent continents muſt have required a time which is indefinite. In like manner, if the former continents were of the ſame nature with the preſent, it muſt have required another ſpace of time, which is alſo indefinite, before they had come to their perfection as a vegetable world.

96 Immenſe ſpace of time required for the deſtruction and reproduction of the dry land.

97 Of the manner of their diſſolution and production.

"It is neceſſary, however, that the preſent land ſhould be worn away and waſted exactly in proportion as new land ſhall appear; or converſely, that an equal proportion of new land ſhould always be produced as the old is made to diſappear. It is only required, that at all times there ſhould be a juſt proportion of land and water upon the ſurface of the globe, for the purpoſe of a habitable world. Neither is it required, in the actual ſyſtem of this earth, that every part of the land ſhould be diſſolved in its ſtructure, and worn away by attrition, ſo as to be floated in the ſea. Parts of the land may often ſink in a body below the level of the ſea, and parts again may be reſtored, without waiting for the general circulation of land and water; which proceeds with all the certainty of nature, but which advances with an imperceptible progreſſion. Many ſuch apparent irregularities may appear without the leaſt infringement on the general ſyſtem. That ſyſtem is comprehended in the preparation of future land at the bottom of the ocean, from thoſe materials which the diſſolution and attrition of the preſent land may have provided, and from thoſe which the natural operations of the ſea afford.

"We have been now ſuppoſing, that the beginning of our preſent earth had been laid in the bottom of the ocean at the completion of the former land; but this was only for the ſake of diſtinctneſs. The juſt view is this, that when the former land of this globe had been complete, ſo as to begin to waſte and be impaired by the encroachment of the ſea, the preſent land began to appear above the ſurface of the ocean. In this manner we ſuppoſe a due proportion of land and water to be always preſerved upon the ſurface of the globe for the purpoſe of a habitable world, ſuch as we poſſeſs. We thus alſo allow time and opportunity for the tranſlation of animals and plants to occupy the earth. But if the earth on which we live began to appear on the ocean at the time when the laſt began to be reſolved, it could not be from the ma-

98
Preſent earth conſtructed from the materials of the third before it.

terials of the continent immediately preceding this which we examine, that the preſent earth had been conſtructed: for the bottom of the ocean muſt have been filled with materials before land could be made to appear above its ſurface.—Let us ſuppoſe, that the continent which is to ſucceed our land is at preſent beginning to appear above the water in the middle of the Pacific Ocean; it muſt be evident, that the materials of this great body, which is formed, and ready to be brought forth, muſt have been collected from the deſtruction of an earth which does not now appear. Conſequently in this true ſtatement of the caſe, there is neceſſarily required the deſtruction of an animal and vegetable earth prior to the former land; and the materials of that earth which is firſt in our account, muſt have been collected at the bottom of the ocean, and begun to be concocted for the production of the preſent earth, when the land immediately preceding the preſent had arrived at its full perfection. This, however, alters nothing with regard to the nature of thoſe operations of the globe; the ſyſtem is ſtill the ſame. It only protracts the indefinite ſpace of time in its exiſtence, while it gives us a view of another diſtinct period of the living world; that is to ſay, the world which we inhabit is compoſed of the materials, not of that which was the immediate predeceſſor of the preſent, but of the earth which, in aſcending from the preſent, we conſider as the third, and which had preceded the land that was above the ſurface of the ſea while our preſent land was yet beneath the water of the ocean. Here are three diſtinct ſucceſſive periods of exiſtence; and each of them is, in our meaſurement of time, a thing of indefinite duration. We have now got to the end of our reaſoning; we have no data farther to conclude immediately from that which actually is; but we have got enough. If the ſucceſſion of worlds is eſtabliſhed in the ſyſtem of nature, it is in vain to look for any thing higher in the origin of the earth. The reſult therefore of our preſent inquiry is, that we find no veſtige of a beginning, no proſpect of an end.”

99
Eternity of the world the final reſult of this theory.

100
Whitehurſt's theory.

VI. Though the theory of which we have now given ſuch a large abſtract is the moſt laboured and complete that hath yet appeared, it is ſtill neceſſary to take notice of ſome other attempts, though perhaps leſs calculated to draw the attention of the public than that of Dr Hutton. One of theſe is by Mr Whitehurſt; of which the following is the moſt material part of an abſtract given by himſelf at the end of his work.

101
The globe originally in a fluid ſtate.

“1. The globe we now inhabit was originally in a ſtate of fluidity; and that not owing to any diſſolvent principle or ſubſequent ſolution, but to the firſt aſſemblage of its component parts. Whence it is preſumed, that the earth had a beginning, and has not exiſted from eternity, as ſome have imagined; though the preciſe number of ages it has exiſted have not yet been actually determined.”

102
Proved from its ſpheroidal figure.

The proof given by our author of this original fluidity of the earth reſts entirely upon its oblate ſpheroidal form; which a fluid globe may eaſily be ſuppoſed to aſſume, though we cannot conceive how a ſolid one ſhould do ſo.

103
Its parts blended together into a ſoft pulp.

2. “The fluidity of the earth, and the infinite diviſibility of matter, evidently ſhow, that the component parts of air, earth, water, &c. were uniformly blended together, none being heavier or lighter than another; whereby they compoſed an uniform maſs or pulp, of equal conſiſtence in every part, from its ſurface to its centre: conſequently the new formed globe was unfit for animal or vegetable life; and therefore it would ſeem extremely abſurd to ſuppoſe that either the one or the other were created during the chaotic ſtate of the earth, or prior to its being formed into an habitable world: therefore the preſumption is great, that mankind were not created till the earth was become ſuitable to the nature of their exiſtence.”

104
Proved from the ſolution of metals in acids, &c.

The proof of this poſition is laid down in the following manner. “It is a truth univerſally known, that the component parts of the moſt denſe bodies become ſuſpended in whatever menſtrua they are diſſolved; as for inſtance, the particles of gold in aqua-regia, ſilver in aquafortis, ſalts in water, and water in air. Nay, we may likewiſe add, that the component parts of mercury, in the act of diſtillation, become ſuſpended in air, notwithſtanding the ſpecific gravity of the former is to that of the latter as 11,000 to 1 nearly. Such, therefore, are the conſequences ariſing from the infinite diviſibility of matter, none being heavier or lighter than another when thus reduced to their original elementary principles.”

105
Parts of the chaos endowed with various attractions.

3. “The component parts of the chaos were heterogeneous, or endowed with peculiar laws of *elective attraction*; whereby ſimilar bodies are diſpoſed to unite and form ſelect bodies of various denominations, as air, water, earth, &c.: by means of theſe principles the chaos was progreſſively formed into an habitable world.

“But the firſt operation which preſents itſelf to our conſideration is the oblate ſpheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force; which was no ſooner completed, than the component parts began to act more freely, according to their affinities: hence the particles of air united to thoſe of air, thoſe of water to water, and thoſe of earth to earth; and with their union commenced their ſpecific gravities, and deſtroyed that uniform ſuſpenſion which had hitherto prevailed throughout the chaotic maſs. Thus commenced the ſeparation of the component parts; for thoſe of the greateſt denſity began their approach toward the centre of gravity; and thoſe of the greateſt levity aſcended towards the ſurface: therefore, as air is nearly 800 times lighter than water, the preſumption is great, that the former was ſooner freed from the general maſs than the latter, and formed a kind of muddy impure atmoſphere, ſurrounding the newly formed globe. Water, being next in levity, ſucceeded the air, and univerſally encompaſſed the earth in one vaſt ocean. In proceſs of time theſe elements became perfectly pure and fit for animal life.

106
How the ſeparation of its component parts took place.

107
Iſlands formed by the attraction of the ſun and moon.

4. “The component parts of the chaos being thus progreſſively ſeparated and formed into ſelect bodies, the following conſequences neceſſarily enſued; namely, as the ſun and moon were coeval with the chaos, the ſolids could not uniformly ſubſide from every part of the ſurface, and become equally covered by water; for as the ſeparation of the ſolids and fluids increaſed, ſo, in like manner, the tides increaſed, and removed the former from place to place without any order or regularity. Hence the ſea became unequally deep; and theſe inequalities daily increaſing, in proceſs of time dry land appeared, and divided the waters which had

hitherto

hitherto prevailed univerſally over the earth. The primitive iſlands being thus formed, in proceſs of time became firm and dry, and fit for the reception of the animal and vegetable kingdoms.

108 Several days muſt have elapſed before the ſun became viſible.

5. "Such appears to have been the natural order and progreſſion of theſe things; conſequently, as the ſun was coeval with the earth, ſeveral days and nights muſt have preceded the ſun's firſt appearance in the heavens, or its becoming viſible on the fourth day, according to the ſcripture account.

109 Order in which terreſtrial bodies were created.

6. "The atmoſphere, ſea, and land, being thus formed for the reception of the animal and vegetable kingdoms in ſucceſſive periods of time, we have now to conſider the order in which they were ſeverally created. Firſt, ſince it appears that the ocean became perfectly pure and fit for animal life before the primitive iſlands were formed, therefore we have endeavoured to prove from a ſeries of undeniable facts (A), that marine animals were firſt formed; and being extremely prolific, they increaſed and multiplied ſo exceedingly as to repleniſh the ſea from pole to pole. The ocean being thus ſtocked with inhabitants prior to the formation of the primitive iſlands, many of them became enveloped and buried in the mud by the continual action of the tides; particularly all the ſpecies of ſhell-fiſh, which are leaſt able to defend themſelves from ſuch interments. Therefore, ſince the remains of marine animals are imbedded at various depths in the earth, from one to that of ſeveral thouſand feet, and this in all parts of the world hitherto explored, they bear ſufficient teſtimony, that theſe marine bodies were thus entombed at ſucceſſive periods of time; and likewiſe that they were created prior to the primitive iſlands, and conſequently prior to any terreſtrial animals. It may be needleſs further to obſerve, that theſe beds of marine ſhells plainly evince, that they were generated, lived, and died in the very beds wherein they are found, and were not brought from diſtant regions by a flood or floods of water, as ſome people have ſuppoſed; conſequently ſuch beds were originally the bottom of the ocean.

110 Marine animals firſt formed.

111 Have been buried in the earth at ſucceſſive periods of time.

112 Mountains and continents formed by ſubterraneous fire.

7. With regard to the mountains, and indeed the continents alſo, Mr Whitehurſt is of opinion, that they are the effects of ſubterraneous fire. His ſentiments on this ſubject, however, are ſomething ſingular; for he tells us, that "mountains and continents were not primary productions of nature, but of a very diſtant period of time from the creation of the world, when the ſtrata had acquired their greateſt degree of firmneſs and coheſion, and the teſtaceous matter had aſſumed a ſtony hardneſs."

113 Theories of Burnet, &c. inſufficient.

Thus we have given a very particular account of all the theories of any note concerning the formation of the earth which have yet made their appearance. The deficiency of thoſe of Burnet, Woodward, Whiſton, and Buffon, muſt be exceedingly obvious even to the moſt ſuperficial reader. They all aſſume only the powers of attraction and repulſion as agents; without conſidering that theſe two powers, or indeed any other two with which we are acquainted, could only have compoſed matters nearly ſimilar to each other. If the original particles of matter are homogeneous, and endowed with ſimilar powers, all the matter we ſee ought to be homogeneous alſo. But this is far from being the caſe. Some parts of it we ſee are exceedingly hard, others proportionably ſoft. The parts of ſome bodies attract each other violently; thoſe of others have hardly any attraction for each other, but are ſeparable by the ſmalleſt force. And though it ſhould be granted that the powers of attraction and repulſion were originally different in different parts of matter, we have ſtill to explain by what means the ſimilar parts of matter found out each other in ſuch a chaos as the earth originally was. This ſeems an inſuperable difficulty in the ſyſtems of Drs Burnet and Woodward; and is equally, though leſs conſpicuouſly ſo, in thoſe of Whiſton and Buffon.

114 Powers of attraction and repulſion inſufficient.

115 Deficiency of Mr Whiſton's theory;

Mr Whiſton's ſyſtem has another and very remarkable defect. He ſuppoſes the earth to have been originally a comet, and at a certain time to have become a planet: but he forgets to tell us by what means this comet was originally formed, or what kind of bodies the comets are. Yet certainly this theory of the comet was as neceſſary to his ſyſtem as the theory of the earth itſelf: for all the ſubſtances now exiſting on the earth muſt originally have exiſted in the comet; and if the natural powers were known which made a diſtinction between one ſubſtance and another in the comet, we would alſo know thoſe which diſtinguiſhed terreſtrial ſubſtances from one another. But though even this great deficiency ſhould be overlooked, the ſuppoſition of a chaos or original confuſion of any kind involves us in the greateſt difficulties. If the whole ſurface of the earth conſiſted of a chaos of melted matter, we cannot reaſonably think it would have appeared otherwiſe when cool than the lavas of burning mountains do juſt now; and this is a conſequence of his ſyſtem which Mr Whiſton ſeems to have entirely overlooked.

116 Of Mr Buffon's.

Mr Buffon's theory is liable to the ſame difficulties with the reſt. He places his chaos in the ſun; and therefore ought to have given a theory of the ſun before he gave one of the earth. It ought alſo to have been ſhown for what purpoſe the ſun was created when he had nothing to ſhine upon, or what probability there is that comets exiſted when there were no planets. His account of the formation of the planets by the ſtroke of a comet, is juſt within the verge of *poſſibility*; but his account of the formation of mountains by the motion of the winds and tides, is certainly inconſiſtent with the common principles of mechanics. Though it ſhould be granted, that water can diſſolve every terreſtrial ſubſtance when vitrified by a heat 10,000 times greater than our hotteſt furnaces, as the ſun muſt neceſſarily be; and though the water ſhould let fall this matter as a ſediment in what quantities and forms we think proper to imagine; it is impoſſible any of it could be thrown two or three miles above the ſurface of the water, in order to form thoſe high mountains which are to be met with in different parts of the world. It is indeed very plain, that though by the motion of the waters their ſediment might be collected in great heaps, it could never reach higher than their ſurface. The mountain,

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(A) Theſe proofs are afterwards conſidered, as here our author ſeems to be of the ſame opinion with Dr Hutton.

mountain, once formed, muſt then be for ever covered with water; for the ſediment would take up preciſely the ſame bulk when a mountain that it did when in a ſtate of diſſolution, and the water could never retire from it as he ſuppoſes. If the waters retired into vaſt ſubterraneous caverns, according to another of Mr Buffon's ſuppoſitions, they muſt have remained for ever in theſe caverns, from whence they could not have returned to effect thoſe wonderful changes he aſcribes to them. But what in the ſtrongeſt manner ſhows the fallacy of Mr Buffon's hypotheſis, is the analogy he draws between mountains on dry land and iſlands in the ſea. The iſlands, he ſays, are only the tops of great mountains in the ocean. If, therefore, the ocean had for a ſeries of many ages covered the preſent habitable part of the world, as our author ſuppoſes, we ſhould undoubtedly find many mountains upon the dry land, the tops of which had formerly been iſlands. But no ſuch thing is to be found. There is not on earth a mountain with a top broad and flat like the iſland of Great Britain or Ireland, or even like iſlands of much leſs conſideration.

117
A number of natural powers beſides attraction and repulſion proved to exiſt.

Theſe, and many other objections that will naturally occur to an attentive reader, ſhow the extreme difficulties under which the hypotheſis of Mr Buffon labours, as well as others. Theſe difficulties ariſe, in the firſt place, from their aſſuming too few natural powers. Though it is certain that the powers of attraction and repulſion exiſt in nature, it is no leſs certain that there are many others. One very remarkable power entirely different from thoſe of attraction and repulſion, may be called the power of *aſſimilation* or *tranſmutation*. By this, each animal, and each plant, changes the nutritious particles thrown into its ſtomach, or which it meets with in the earth, into a ſubſtance of its own peculiar kind. Thus, a ſtalk of wheat, by means of its roots, always aſſimilates the nutritious particles of the ground into that particular grain we call wheat, and no other. This power naturaliſts have not been able to explain on the principles of attraction and repulſion, or any others with which we are acquainted; and therefore it may juſtly be called one of the primary laws of this earth at leaſt, whether we underſtand the manner in which it operates or not.—Another power which ſeems to be diffuſed throughout this terraqueous globe, and common to all ſubſtances, water alone excepted, is that of multiplying themſelves, or producing others of the ſame ſpecies. With regard to plants and animals, this is exceedingly evident; but may be diſputed in the caſe of minerals. It is certain, however, that mines which have been exhauſted, will in time be again repleniſhed with ore; that ſpars and cryſtals, if broken or cut while their connection with the earth remains, will protrude a ſubſtance ſimilar to the reſt, as certainly as the wounded body of an animal will protrude fleſh of a kind ſimilar to what was taken away. The earth itſelf is capable of this multiplication. We ſee how it hath a tendency to aſcend, and cover ſtones, &c. which lie a long time on its ſurface; and thus does this element, ſeemingly the moſt ſluggiſh of all others, ſwallow up every thing that lies for ſome time undiſturbed upon it. Hence we now meet with many monuments of antiquity below ground, which formerly were undoubtedly above it. Yet we have no right from thence to conclude, that the height of the dry land above the water was greater at that time than what it is now. This multiplication of earth is chiefly owing to vegetation; which continually produces a new cruſt on the top, and thus tends to bury all ſuch matters as reſt upon the ſurface. This cruſt, however, does not produce a continual increaſe in the height of the dry land; for whatever quantity the vegetables add to the ſurface, they take from the under parts by the ſuction of their roots. Thus the ground becomes more porous, and the weight of ancient buildings, ſtones, &c. gradually forcing them downwards, they are at laſt buried under ground to a conſiderable depth.—Hence it is eaſy to account for the ſinking of the marine bodies that are to be found at different depths in the earth, even ſuppoſing them to have been left on its ſurface by the deluge. M. Buffon's objection, drawn from the great quantities of them, ſeems but very weak: for it is certain, that marine animals, both of the cruſtaceous and other kinds, are found in the ſea at this day in amazing quantities; and there is no bed of ſhells ſo large, that we can reaſonably think it *impoſſible* for all the animals to have exiſted in it at once.

118
Appearance of ſhells at great depths accounted for.

119
Changes may naturally happen in the ſtrata of the earth.

With regard to the ſtrata, it ſeems undeniable that they may be produced from natural cauſes. Clay will ſometimes be conſolidated into ſtone; flint, marble, and limeſtone, are all found to grow naturally in the earth; ſo that we cannot draw any concluſion from the order in which we now find them. Though we find a bed of ſhells, then, in the heart of a ſolid rock, this makes no difficulty in the theory of the earth; ſince we know that the rock hath by ſome natural cauſe been conſolidated around them. In fact, this is not ſo wonderful, as what is related by Mr Price in his Treatiſe of Minerals, Mines, &c. viz. That at the town of Redruth in Cornwall, "ſome labourers being put to clear and level the ſtreet for a pavement, they found a piece of hard ſtone in the ground, with abundance of common ſmall pins of braſs interſperſed in and throughout the ſtone, in ſuch manner and form, that all thoſe who ſaw it afterwards were convinced it was not done artificially, but that the ſtone was formed and produced by petrifaction, ſubſequent to the time the pins were dropped into the ground. Doctor Plot, in his Natural Hiſtory of Staffordſhire, ſays, that near Newcaſtle under Lyne, there was found a ſtone with a man's ſkull, teeth and all, incloſed in it."—From theſe and other facts in ſome meaſure ſimilar, this author concludes, that every earth or clay, in ſome places, may be converted into ſtone in proceſs of time, at ſuch a depth where it is undiſturbed by being never lacerated nor moleſted, and alſo where it abounds with an uncommon quantity of juices of a lapideſcent quality: but this property being extenuated or deſtroyed, the earthy ſtones may not improbably again return to their primitive clay. Thus we ſee ſome ſorts of ſtone, when dug out of the ground and expoſed to the air for a conſiderable time, do moulder again into earth, at leaſt in appearance; while others, of an earth-like quality, are indurated, and become more compact and durable by lying above ground."

120
Dr Hutton's theory conſidered.

The theory laid down by Dr Hutton is of a different nature from the reſt; and as it has been ſuppoſed directly to militate againſt revelation, merits a very particular conſideration. The expreſſion, however, with

121 Arguments againſt the eternity of the world

122 From the ſucceſſion of worlds ſuppoſed by Dr Hutton.

which he concludes his diſſertation, that "we can find no veſtige of a beginning—no proſpect of an end," might be ſuppoſed to relate only to the deficiency of our underſtandings or mode of inquiry, had he throughout the whole courſe of his work given a ſingle hint of any *materials* from which the world was originally formed. In this he differs moſt eſſentially from the other theoriſts whom we have mentioned; for all of them ſuppoſe a chaos to have been originally created, from whence all the variety of ſubſtances we ſee at preſent have been formed. But as the Doctor makes no mention of any thing prior to a world nearly ſimilar to what we ſee juſt now, we muſt neceſſarily conclude that its eternity is a part of his creed. Now, that the world has not been eternal, may be proved from what he himſelf allows. Wherever we perceive a ſucceſſion, we know that there muſt of neceſſity have been a beginning: but, according to our author, there has been a ſucceſſion of worlds, by a kind of uncouth generation, ſimilar to what would happen to the human race if a man was to deſcend immediately from his grandmother. Proceeding in this way, therefore, we muſt at laſt arrive at one great-grandmother of earths, from whence all the reſt were deſcended; and of this one a theory was no leſs neceſſary than of any of her ſucceſſors. This theory would have been the more difficult, as his great element *cockle-ſhells* and *oyſters* would then have been abſent, and the materials from whence they were afterwards to be produced muſt have been ſought for.

123 A ſupernatural power neceſſary in the formation of the world.

124 Shown from the production of animals and vegetables.

Another argument, which evidently ſhows not only that the world is not eternal, but that ſome other power beſides its own interfered with it originally, may be taken from the exiſtence of animals and vegetables; both of which our author allows to have had a place throughout all his worlds. We ſee at preſent, that animals proceed from animals, and vegetables from vegetables; but the time muſt have been, when an animal was produced without a parent, and a vegetable without a ſeed. At this time the world muſt have been influenced by a power different from any it poſſeſſes at preſent; for no ſuch power is now to be found in any part of the globe.

125 Quantity of ſhells found on earth too ſmall on the Doctor's principles.

126 Amazing increaſe of ſhell-fiſh.

Laſtly, the quantity of ſhells, great as it is, can by no means be reconciled with an eternal ſucceſſion of worlds, or even with three; for, according to him, we muſt have *three* in order to have *two* habitable ones; *viz.* one lying at the bottom of the ſea, another wearing away, and another beginning to emerge. Now he informs us, that only a fourth part of our land is compoſed of calcareous matter derived from marine animals*. But if one of the worlds has continued for a time *indefinite*, and conſequently another lain at the bottom of the ſea for an equal length of time, it muſt, inſtead of having a fourth part of its ſoil compoſed of calcareous matter at the time of its emergence, have been entirely compoſed of it, at leaſt if we can credit what is ſaid concerning the prolific nature of theſe animals. Mr Whitehurſt informs us, that "it is not uncommon to take away a bed of ſhell-fiſh ſeveral fathoms in thickneſs; and though the places where they are fiſhed for appear to be entirely exhauſted, yet in the enſuing year there ſhall be as many found in all theſe places as before." Such an amazing increaſe muſt, in a time *indefinite*, eſpecially if repeated for an indefinite number of times, have reduced the whole terraqueous globe to an heap of cockle-ſhells or other ſubſtances of that kind.

127 A ſupernatural power muſt have taken place in the original formation of vegetables.

Our author is equally unfortunate in the very firſt ſtep of his argument, where he ſays that the ſoil is only "the materials collected from the deſtruction of the ſolid land." He owns that all his earths produced vegetables; but theſe muſt have had a ſoil whereon to grow before the firſt world had time to be deſtroyed. We are therefore here in the ſame dilemma with regard to the ſoil that we were before with regard to the vegetables; and as we are obliged to own the interference of a Superior power to produce the firſt vegetable, ſo muſt we alſo have recourſe to the ſame power for the production of the ſoil on which it grew. All theſe conſiderations ought to have led the Doctor to a concluſion very different from that which he has drawn, and to have ſhowed him that the *beginning* of the world was occaſioned by a power which cannot poſſibly be inveſtigated, becauſe it lies without the bounds of Nature itſelf, and far beyond the reach of our faculties.

128 Origin of the earth cannot be accounted for from natural cauſes.

129 Too much attributed to calcareous earth and flint by Dr Hutton.

This objection indeed militates invincibly againſt all theories of the earth which ſeek to derive its original from natural cauſes. The powers of attraction and repulſion we have already ſhown to be inſufficient; and though we ſhould add to them thoſe of fire and water, with all the train of ſolvents and precipitants which chemiſtry can afford, the deficiency will ſtill be as great. It is true, that by means of chemiſtry we can imitate many of the natural operations, provided we have the proper materials: But this is the capital defect in all our theories of the earth. Whence came vaſt quantities of argillaceous earth into one place, of ſiliceous earth into another, of the materials for iron, ſilver, gold, &c. into the places where they are now found? With Dr Hutton indeed the whole ſeems to be compoſed of two materials, *viz.* calcareous earth and flint. But before he could juſtify this aſſertion, he ought to have produced from theſe two materials, at leaſt a great number of the different ſubſtances with which the earth is repleniſhed. But inſtead of this, he has recourſe to natural productions, formed, as he ſays, by means which, in the hands of the beſt chemiſts, will prove inſufficient to produce any thing like them.

130 Calcareous matter proved to exiſt independent of marine animals.

In his account of the origin of calcareous matter, he tells us, it is to be derived entirely from the ſhells of marine animals; but he forgets to inform us whence theſe animals got their ſhells. There muſt have been ſome ſource of calcareous matter from which the *firſt* oyſter (for we have already ſeen that they could not have exiſted from eternity) derived its ſhell, and that independent of any other marine animal. Now we ſee at this day an abundant ſource from whence the ſhells of all marine animals may be derived, *viz.* the waters of the ocean, which contain a great quantity of calcareous matter. If we inquire whence theſe waters have it, we may ſay they take it up from the earth, part with it again in the form of ſhells, corals, &c. rediſſolve it, and ſo on. But if we will ſtill inquire farther whence the earth itſelf had it, we muſt once more have recourſe to that unſearchable and ſupernatural power to which we aſcribed the origin of animals, vegetables, and the ſoil whereon they grow.

It is the foundation of Dr Hutton's theory, and in-

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*See nº 90.

131 Earth proved not to have remained long at the bottom of the ſea.

deed ſeems now to be a favourite doctrine of moſt theoriſts, that the earth we inhabit has once been at the bottom of the ſea; and it is thought to be a ſufficient proof of this, that ſuch vaſt quantities of marine ſhells are to be met with on dry land. Mr Whitehurſt, after giving a long account of theſe ſhells, infers, among other things, that the "beds of foſſil ſhells, which conſiſt of one ſpecies only, and are not natives of the climate where found, but of very diſtant regions of the earth, evidently ſhow that they were generated, and have lived and died in the very beds where found; and could not have been removed from their native climates by a flood or floods of water, with ſo much order as to form beds conſiſting only of one ſelect ſpecies; and therefore all ſuch beds muſt have been originally the bottom of the ocean."

132 Falſe mode of reaſoning adopted by many theoriſts.

On this mode of reaſoning, however, we muſt obſerve, that no hypotheſis can have a worſe foundation than when it is built confeſſedly on our own ignorance. We know not, for inſtance, how a bed of foſſile ſhells came into a certain place; therefore the whole world has been at the bottom of the ſea for many thouſand years, the climates have changed, or it has been eternal! Thus to unhinge the ſettled laws of nature for ſuch trivial purpoſes, is certainly the greateſt contradiction to true reaſoning that can be imagined. But it is not only from a negative argument of this kind that we may refute this hypotheſis; there is a much ſtronger one drawn from the marine productions themſelves. It is certain, that there are ſubſtances very different from ſhells of any kind, which grow up from the bottom of the ocean, and in time *indefinite* aſcend all the way to the ſurface, and there form iſlands. Theſe are the coral rocks ſo common and ſo dangerous in the South Sea, and of which many of the iſlands there are formed. Now, how comes it to paſs, that among all the marine monuments to be found on land we find no coral rocks growing there? The anſwer to this is obvious. The coral rocks require a vaſt length of time for their production, and are ſtrongly fixed to the place where they grow; they cannot therefore be removed over land by any ſudden flood or inundation, not even by a general deluge. Though it appears therefore, from the ſhells and other marine moveables, that what is now dry land has once been at the bottom of the ſea, yet it is equally evident from the deficiency of theſe rocks, that it has not remained ſo for any length of time; and therefore, though we ſhould by no means be able to explain all the appearances of foſſile ſhells, we are not to admit a ſuppoſition which, from the circumſtance juſt mentioned, cannot poſſibly be true.

133 The want of coral rocks on land ſhows that it has not been long at the bottom of the ſea.

134 Why every appearance of foſſil ſhells cannot be explained.

With regard to theſe ſhells, however, we muſt remark, that it is in vain to attempt the explanation of every appearance; nor can any ſuch thing be reaſonably deſired, even though we ſhould acknowledge the deluge to be the univerſal cauſe. We know not, nor can we have any conception of, what might be accompliſhed by the mere mechanical motion of the waters in this caſe. Every one who has had an opportunity of ſeeing the effects of a violent land-flood, will be ready to own that it has performed things which *à priori* he would not have thought it could have done. But how infinitely muſt theſe effects be exceeded by one vaſt deluge, in which not only the dry land was ſoftened by an inceſſant rain of ſix weeks, but the ſea roſe on all ſides, and poured in upon it with all the moveable contents which the waters carried along with them?

135 Of the effects which the deluge certainly produced.

136 Vaſt numbers of ſhells muſt have been brought along with it.

That great numbers of ſhells already formed would be brought along with the waters of the ocean, is an aſſertion which can ſcarce be denied; and we ſhall be inclined to look upon this number as exceedingly great, if we conſider the way in which it is moſt probable that the deluge came on. This was by the iſſuing out of waters* from every pore of the earth and bottom of the ocean, as well as by their deſcent from the clouds. In conſequence of the former action, all the light bodies at the bottom of the ſea muſt have been turned topſy turvy, and carried up no one can tell how far; at the ſame time that by the progreſſive motion of the waters they were carried to an unknown length over the land, and there depoſited when the motion ceaſed.

137 The fiſh would leave their former abodes to dwell over land.

This circumſtance of itſelf will account for the appearance of vaſt numbers of ſhells and other marine productions on land; but there is another which muſt be taken along with it, and will undoubtedly add greatly to its force. The unfathomable depths of the ocean are not the proper habitations of fiſh; and they are only found on ſhoals, or near the ſea-coaſts. At the time of the deluge, therefore, great numbers of the marine animals muſt have exchanged their ancient habitations for thoſe where the water was more ſhallow; and of conſequence would have abounded on the tops of mountains and other elevated places. Whether thoſe animals whoſe exuviæ are moſt plentifully met with on land have any locomotive power when full-grown, is uncertain; but whether they have or not, they are certainly of ſuch minute ſizes when young, that they may be floated to any diſtance by water. Thus therefore any kind of ſhell-fiſh may have reached any place in the globe; and Mr Whitehurſt himſelf owns, that they can arrive to their full maturity in leſs than a year, as the beds which have been exhauſted one year are found to be repleniſhed the next. Now the flood, according to the Scripture account, continued long enough to allow time for their increaſe from ſpawn to their full ſize. It arrived at its full height in 40 days; and continued ſtationary for five months. It then began to decreaſe; but ſo gradually, that it was not till the firſt day of the tenth month that the tops of the mountains began to appear above the ſurface of the water; and it was not till towards the end of the eleventh that the tops of trees began to emerge. Here then we have time for beds of ſhell-fiſh to grow, live, and afterwards be left by the water; which in their mature ſtate they could not follow, and thus to die in the places where they were generated.

138 The continuance of the flood allowed time for ſhell-fiſh to breed on land.

Thus far we may ſafely argue with regard to the exiſtence of large beds of ſhells on the ſurface of the earth: and it has already been ſhown how the earth would naturally cover and ſwallow them up to a conſiderable depth. But to account for the great depths at which we find them ſometimes buried, ſeveral other things muſt be taken into conſideration. One is, that the earth, by the continual rains at the time of the deluge, as well as by the iſſuing of the waters everywhere through its ſubſtance, muſt have been exceedingly ſoft and eaſily penetrated. The helpleſs animals,

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139 Numbers of ſhells would be ſunk deep into the earth by the preſſure of the waters.

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* See *Deluge*.

therefore, brought along with the ocean at its firſt irruption over land, would have been deep buried in the mud: and when we take into our account the preſſure of a column of water four miles deep, it is impoſſible to ſay what effects this cauſe might have produced. They might, beſides, have been accumulated in clefts of rocks, in hollows, valleys, and caves; and have been there conſolidated by petrifaction and the growth of calcareous matter over them. And that ſomething ſimilar to this actually happens, we are very certain: for Mr Whitehurſt informs us, that "the ſprings of Matlock bath in Derbyſhire, though extremely pellucid and friendly to the human conſtitution, are nevertheleſs plentifully ſaturated with calcareous matter, which readily adheres to vegetables and other ſubſtances immerſed in their ſtreams; and thus, by a conſtant accretion, large maſſes of ſtone are gradually formed. The banks on which the bath-houſes ſtand, and likewiſe the buildings themſelves, are moſtly compoſed of ſuch materials."—Now, had theſe waters directed their courſe over a bed of ſhells, through a burying-place, or over a field of battle, it is evident that they would have incloſed a great number of ſhells, human and horſe bones, heads of lances, ſwords, or even the more modern weapons of guns and piſtols; which, to a curious naturaliſt, might have furniſhed an argument for the antiquity of theſe latter weapons. If therefore we ſee that bodies at this day may be ſo eaſily imbedded in ſtone, why ſhould we pretend to ſet bounds to the petrifactions which may have happened in the courſe of more than 4000 years? a period far beyond the reach of our moſt ancient hiſtories.

140
General recapitulation of facts.

141
Examples of bodies incloſed by ſtone.

It is not meant, by what we have juſt now ſaid, to explain all the appearances of foſſil ſhells or bones from the deluge as a general cauſe. This cannot be done unleſs we knew all the circumſtances. The following facts, however, may be looked upon as authenticated. 1. That when the waters overwhelmed the land, great numbers of marine animals were carried along with it. 2. That during its continuance moſt of thoſe which have any locomotive power would chooſe rather to dwell over land than in places which had formerly been their reſidence. 3. That while the waters remained on the earth, all kinds of marine animals would breed over land in their natural way; and ſuch as could not follow the waters in their retreat, would be left to die on dry land, which muſt have been the caſe particularly with ſhell-fiſh. 4. Theſe impotent animals, which have little or no power of locomotion, would by the preſſure of a column of water four miles high be buried to depths unknown. 5. After the retreat of the waters, thoſe which had been lodged in hollows or clefts, or perhaps diffuſed through the ſubſtance of many ſoft ſtrata, might by ſome petrifying quality in the ſtratum be ſo conſolidated along with it as afterwards to form one entire rock. This is evident, not only from the example of the Matlock-ſprings, but more ſo from that of the pins found in the ſtone at Red-Ruth in Cornwal, from the petrified ſkull mentioned by Dr Plott, and many others; of which we ſhall mention the following from Mr Whitehurſt.—"The ſtrata of limeſtone in Derbyſhire, and in many other parts of England, abound with the exuviæ of marine animals, or the impreſſions of them in the ſolid ſubſtance of the ſtone; and we have likewiſe ſeveral inſtances related by authors of the bones of terreſtrial animals, and alſo of wood, having been found inveloped in ſtrata of ſtone. A complete human ſkeleton, with Britiſh beads, chains, iron-rings, braſs bits of bridles, were dug up in a ſtone-quarry near the Earl of Widdrington's ſeat at Blanknay in Lincolnſhire.—Human bones and armour, with Roman coin, fibulæ, &c. were found in a ſtone-pit in the park at Huſtanton in Norfolk, ſuppoſed to have been buried after a battle.—In the mountains of Canne, half a league from Maeſtrick, were found the remains of a crocodile well preſerved in a ſtratum of ſand-ſtone.—The remains of a crocodile were alſo found in a ſtratum of ſtone at Blenheim.—The beds of argillaceous ſtone, &c. incumbent on coal, alſo contain a great variety of figured foſſils repreſenting different parts of the vegetable creation."

142
The deluge may be ſuppoſed the general cauſe of foſſil animal ſubſtances.

From all theſe examples it is plain, that the lapideſcent power which the earth poſſeſſes is capable of incruſting bodies with ſtone to an unknown thickneſs. In whatever ſituation therefore we find thoſe foſſil bodies, we have no reaſon to ſay that the deluge is not ultimately the cauſe of their being there; becauſe its power in overſpreading the earth with them, in burying them in it, or forcing them into clefts and caverns, is altogether unknown: and before it is denied that the deluge could be the cauſe of ſuch appearances, it is neceſſary to ſhow all that it really *could* do, which is evidently impoſſible; ſo that here our ſpeculations muſt ultimately reſt.

143
Of foſſil human bones.

We ſhall only add one other fact which muſt certainly have taken place at the deluge. At that time the world is generally thought to have been very full of inhabitants. Theſe, as well as all the inferior animals, would naturally fly from the approaching danger. This would aſſemble them in great numbers in ſuch places as appeared to afford ſecurity; and here they would all periſh together. This will account for the vaſt heaps of bones found in certain parts of the world, as in the rock of Gibraltar, Dalmatia, &c. and the natural petrifactive power of the earth may account for their conſolidation. The ſlaughters which mankind have made of one another may indeed account for many of theſe appearances. When we read in hiſtory of 40,000, 50,000, or 100,000 men being killed in a battle, we never think of the ſpace their bones would occupy when thrown into a heap; nevertheleſs, we are aſſured that the bulk of theſe remains muſt be very great. Tamerlane, with an army of 800,000 men, filled up the harbour of Smyrna by cauſing each of his ſoldiers throw one ſtone into it; and when Marius defeated the Cimbri, the bones of the ſlain were ſo numerous, that they were uſed for a long time as fences for vineyards. Had theſe been collected into one heap, and afterwards conſolidated by petrifactive matter, they would undoubtedly have occupied a very conſiderable ſpace. What then muſt have been the caſe, when every man, nay every other terreſtrial creature, died at once? Taking all theſe things into conſideration, it muſt ſurpriſe us that the collections of foſſil bones are not more numerous than we find them.

Thus we ſee, there is on the one hand no reaſon for denying that the deluge has been the cauſe of all the foſſil appearances we perceive; and on the other, that

144 Dr Hutton's account of the formation of the ſtrata conſidered.

145 His theory overthrown by an experiment of Bergman's.

there is the ſtrongeſt reaſon for denying that the land we inhabit has been for a length of time at the bottom of the ſea. Diſmiſſing therefore this part of Dr Hutton and Mr Whitehurſt's theories, we ſhall now proceed to conſider that of the former, where he inveſtigates the formation of the ſtrata. Theſe, he ſays, could not be formed by aqueous ſolution. That they could not be ſo originally, we readily grant; but that they have preſerved themſelves from decay, transformed themſelves into one another, and repaired their waſte by this means, is abſolutely certain. The Doctor indeed gives up his own argument; for he tells us, that "if flint can be produced by cryſtallization from water or any aqueous ſolution, then may his aſſertions concerning the conſolidation of the ſtrata be denied." But Mr Bergman aſſures us, that he actually did produce flint by allowing a quantity of fluor acid to ſtand for two years on ſome powdered quartz; and this is more than any chemiſt can pretend to do by the violent heat of fuſion, to which Dr Hutton has recourſe on all occaſions. We do not pretend, however, to ſay, that the different ſtrata of earth have been formed originally by aqueous ſolution. For this we muſt have recourſe to the power already mentioned, and for want of which neither Dr Hutton's theory nor any other can ſupport itſelf. But though the ſtrata were originally formed by Divine power, they are certainly preſerved, repaired, and changed by natural cauſes; of which aqueous ſolution is a principal, though not the only one.

146 Wood may be penetrated by flint in a ſtate of ſolution.

The ſaid experiment of Mr Bergman's entirely overthrows the Doctor's objection (n° 39.) relating to the penetration of wood by ſiliceous or flinty matter. It ſhows, that the matter in queſtion may be diſſolved, and in no very long time depoſited in its proper form; ſo that had Mr Bergman incloſed a bit of wood in his bottle which produced the flint, there is no reaſon to doubt that it would have been ſo penetrated by the ſiliceous matter as to be completely *flintified* (to uſe Dr Hutton's word) by the end of the two years.

147 Flints may thus grow in the heart of chalk.

148 Extreme abſurdity of ſuppoſing wood to be penetrated by melted flint.

The *impoſſibility* which our author talks of, of flinty ſubſtances being found inſulated in the midſt of beds of chalk, is likewiſe thus removed. But if we view his own account of the petrifaction of wood by the action of melted flint, what mortal in his ſenſes can give him credit? It exceeds the power of a glaſs-houſe furnace to melt flint by itſelf: how is it poſſible, then, that the combuſtible ſubſtance of wood ſhould bear to be filled with this dreadful fluid without being burnt? The operation being performed under water, will not anſwer the purpoſe: for wood may be reduced to charcoal, by the heat of a burning-glaſs, under water; and a red hot iron, thrown into a wooden veſſel full of water, will burn a hole in the bottom. Dr Black, who mentions this circumſtance in his Lectures, very juſtly obſerves, that the ſteam which is produced keeps off the water until the iron has produced its effect. Muſt not the ſame effect take place at the bottom of the ſea, even granting, what Dr Hutton never can prove, that flint, by any degree of heat whatever, can be reduced to ſuch a ſtate of tenuity as to be capable of penetrating wood like an anatomical injection? Here indeed he may tell us, as on another occaſion, that the compreſſion of the water is *inſuperable* †. But if this be the caſe, how comes it to paſs, that not only this inſuperable compreſſion, but an additional one (no leſs than the vaſt loads of earth which compoſe the continents of Europe, Aſia, Africa, and America), has actually been overcome, and theſe immenſe tracts thrown up from the bottom of the ocean, by the force of fire which could not conſume a piece of wood?

149 Contradiction in the Doctor's hypotheſis.

150 His ſuppoſitions concerning fire entirely unreaſonable.

To ſuppoſe that, by any compreſſion whatever, the element of fire, when applied to a combuſtible body, ſhould be prevented from deſtroying its texture, is certainly without the leaſt foundation; and yet upon this and ſimilar ſuppoſitions proceeds the whole of the Doctor's theory. He differs from thoſe who maintain the volcanic theory, in ſuppoſing that fire may work underground in ſuch a manner as to perform none of its common effects, or indeed none but ſuch as are agreeable to his own hypotheſis. Thus fire, working at the bottom of the ſea, or at an unknown depth under it, ſhall not burn wood; it ſhall not extricate the fixed air from calcareous matter, but melt it ſometimes into one ſubſtance and ſometimes into another; it ſhall not diſſipate the moſt volatile ſubſtance, nor in ſhort perform any effect which we ever ſaw performed by fire: and all this, it ſeems, is demonſtrable by the mere inſpection of fragments of ſtones in a cloſet, without paying the leaſt attention to the operations of nature abroad.

151 His proofs from mineral cryſtallization conſidered.

152 Various ways in which ſubſtances may be cryſtallized.

Though it muſt be very evident that a theory built on ſuch extravagant principles cannot ſupport itſelf, we muſt ſtill take notice of the proofs he adduces from the mineral cryſtallizations, &c. On this ſubject it may be obſerved, that there are various ways by which ſubſtances can be cryſtallized or aſſume regular figures. 1. The moſt common is by ſolution in a large quantity of water, from which the bodies are depoſited by cooling, and form diſtinct and regular cryſtals. 2. By ſolution in no greater quantity of boiling water than will keep them ſuſpended; after which they are formed into large maſſes, as is the caſe with alum. 3. By ſlow evaporation, as is the caſe with vitriolated tartar and ſome other ſalts. 4. By effloreſcence, when a ſaline fluid is mixed with a quantity of earthy matter, and kept moiſt for ſome time. Of this we often have an example in moiſt cellars, or other damp places, where we ſhall ſee part of the walls covered with a fine, downy, ſaline matter. In ſalt-butter alſo we ſhall frequently ſee the ſame appearance; where the ſalt ſhoots into ſmall ſpiculæ, though in the common way it cryſtallizes in cubes. 5. By ſublimation, as in the caſe of flowers of benzoin, of corroſive mercury, cinnabar, ſal ammoniac, orpiment, &c. &c. 6. By the meeting of two ſubſtances in an aerial form, as alkaline and fixed air. By the attraction of fixed air from the atmoſphere or otherwiſe, as is the caſe with alkaline ſalts when long expoſed to the common air, or for a ſhorter time to a ſtream of pure fixed air. 7. By precipitation, as in the arbor Dianæ and other metallic vegetations. 8. By means of acids. Thus the reſiduum of Glauber's ſpirit of nitre, if the diſtillation has been performed with an exceſs of acid, will ſhoot into beautiful ramifications like branches of trees. 9. By fuſion, as in regulus of antimony and other metals, ſulphur, &c.

Now of all theſe different ways by which cryſtallization may be effected, Dr Hutton has choſen only the laſt; and this he obſtinately carries through the whole

ſyſtem

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‡ See n° 46.

ſyſtem of nature, whether reaſonable or not. His argument againſt any other mode is chiefly built upon the inſolubility of certain ſubſtances; but this argument has failed in one very remarkable inſtance, *viz.* that of flint, which has been produced by aqueous ſolution. Another inſtance he brings, n° 42, of "marmor metallicum, conſiſting of terra ponderoſa ſaturated with vitriolic acid, a ſubſtance inſoluble in water."

153 Dr Hutton's argument from the inſolubility of certain ſubſtances inſufficient.

154 Marmor metallicum formed by cryſtallization.

Now though this ſubſtance, when once it is formed, may be termed abſolutely inſoluble; yet the fact is certain, that it may be formed by aqueous ſolution and cryſtallization; and we have done ſo by the following proceſs: Let terra ponderoſa be formed into an hepar ſulphuris by any of the common methods; diſſolve the maſs in water; filter the ſolution, and expoſe it to the air in a veſſel kept in a gentle warmth: the phlogiſton of the ſulphur will gradually fly off; the acid attach itſelf to the earth; and in a day or two a great quantity of fine cryſtalline ſpiculæ will be formed, which are a true marmor metallicum.

155 How bodies naturally inſoluble may be formed by aqueous ſolution.

Thus we learn how many bodies, naturally inſoluble, may yet be formed by aqueous ſolution by reaſon of the ſolubility of their component parts. Sulphur is ſoluble by calcareous earth and by terra ponderoſa, and makes theſe ſubſtances ſoluble in much greater quantity than they naturally are. By the decompoſition of the ſolution of terra ponderoſa, marmor metallicum is produced; and by decompoſing the other, ſelenite or alabaſter.

156 Of the formation of ſelenite.

This laſt ſubſtance Dr Hutton has not thought proper to mention, though huge maſſes of rock are compoſed of it; and it is incapable of fuſion without being deſtroyed. Its regular figures, however, afford us a fine example of that ſpecies of cryſtallization which proceeds from precipitation or accretion. The ſelenite is a ſubſtance very little ſoluble in water; yet by the perpetual depoſition of ſmall quantities, we ſee that beautiful and regular cryſtals are formed: and hence we learn another important fact, *viz.* that in order to form theſe cryſtals, it is not always neceſſary that the whole of the ſubſtance ſhould be diſſolved in water at once, though this is the caſe with our artificial cryſtallizations.

157 Fine cryſtals formed by continued accretion.

The largeſt and moſt tranſparent cryſtals, and even the moſt inſoluble in water, may have been formed by the continual accretion of cryſtalline matter from an aqueous ſolution: and thus they may appear in any cavity whatever; for as there is no mineral ſubſtance impermeable to water, it evidently follows that no cavities can be impermeable to it.

158 Fluor ſpar may be formed by aqueous ſolution.

Among his other inſoluble ſubſtances Dr Hutton mentions fluor and calcareous ſpar. But as we know that one of the component parts of fluor is calcareous earth, naturally ſoluble in water, it is only neceſſary to ſuppoſe a calcareous water like that of Matlock to meet with fluor acid; when as great quantities of fluor would be produced as there are at preſent of calcareous ſtone.

159 And likewiſe calcareous ſpar.

The ſame thing may be ſaid of calcareous ſpar.—We know that fixed air will precipitate calcareous earth from water, or rediſſolve it after it has been precipitated, according to its quantity. The formation of ſpars, therefore, from calcareous matter diſſolved in water and fixed air, may eaſily be underſtood; and we know that there is no water which does not contain ſome quantity of calcareous earth. Of fixed air there is always great plenty in the bowels of the earth; and according to the quantity uniting itſelf with the diſſolved calcareous earth, either chalky concretions or cryſtalline bodies will be produced. If fire were applied to this calcareous matter in order to fuſe it, an emiſſion of the fixed air would be the certain conſequence; and without this we have not the leaſt evidence that calcareous earth ever did or could undergo any fuſion by heat.

160 Of the formation of pyrites by aqueous ſolution.

With regard to the mineralization of metals by ſulphur, as in the caſe of pyrites, we cannot pretend to explain them particularly; though it was certainly incumbent on the Doctor to have formed theſe bodies, or to have produced ſomething like them, by fuſion, before he determined that they were formed originally in this way. It is eaſy, however, to ſee how the calx of a metal may meet with ſulphur in the earth. We know that ſulphur is ſoluble by alkali, by terra ponderoſa, or by calcareous earth. By expoſing this ſolution to fixed air, part of the ſulphur is ſeparated, and may unite with the metallic earth, or any other thing with which it has an affinity. The cryſtallizations of ſulphur artificially united with metals have not indeed been examined; but before we affirm that a metal is mineralized by fuſion with ſulphur, we ought to perform ſomething like it artificially, which never has been done.

161 Formation of cinnabar in the moiſt way.

As to the invincible argument n° 43, where our author triumphantly challenges his adverſaries to ſhow how petro-ſilex, pyrites, and cinnabar, can be diſſolved in water; it may be replied, that Mr Bergman has decided the matter againſt him with regard to the firſt, by his remarkable experiment of making flint: the ſecond is as yet undecided; for no chemiſt has been able to make pyrites either by ſolution or fuſion. The third is likewiſe decided againſt our theoriſt; for Dr Lewis has ſhown that cinnabar may be prepared by ſolution of ſulphur as well as in the dry way by ſublimation. We have only to ſuppoſe therefore that a calcareous ſolution of ſulphur pervaded this mineral; while a number of particles of quickſilver were diſperſed through it; in which caſe the latter, attracting the ſulphureous particles, would form the cinnabar in queſtion.

162 Of metals found native.

Our author's argument (n° 44) from metals being found in their perfect ſtate, is very inconcluſive. The maſs of native iron he ſpeaks of, is by many thought to be factitious; and as to the ſmall bits of other metals ſometimes found native, they rather make againſt him than otherwiſe: for had they been melted, all the reſt of the matters around them muſt have been melted alſo; in which caſe the ſuperior weight of the metals would have carried them to the bottom of the melted maſs, there to unite as in a common furnace.

163 Coals ſuppoſed to be formed from vegetables.

His arguments concerning bituminous bodies are equally unfortunate with the reſt. That coal is derived from wood has been the opinion of very learned men, particularly Dr Black. The argument, however, is only this, that ſometimes we ſee coals with woody fibres, plainly indicating their vegetable original. But this would hold equally with regard to ſtones; for we often ſee wood penetrated with ſtony matter, while its fibrous texture ſtill remains. In this caſe therefore we might as well ſuppoſe that ſtones are derived from wood as that coals are ſo. A deciſive proof that coals are not produced by fuſion, is, 164 Certainly not formed by fuſion.

that a living toad has been taken out of the heart of a ſolid piece of coal. This is ſimilar to the entombment of the fiſhes called *pholades* in the heart of ſtones; and as, in the latter caſe, we believe that the ſtone has concreted round the fiſh, ſo we have the ſame reaſon to believe, in the former, that the coal had conſolidated round the toad. All that we can ſay therefore is, that coal is formed by a natural, and not very tedious proceſs, unknown to us; but that this proceſs certainly is not fuſion. His proof nº 47 is altogether inconcluſive; for we have already ſeen that flinty ſubſtances and marmor metallicum may be produced by aqueous ſolution.

165 Dr Hutton's theory entirely erroneous.

166 His method of accounting for the water contained in ſiliceous bodies.

Thus we have ſeen, that, contrary to our author's hypotheſis, the world has undoubtedly had a beginning; that our dry land has not, for ages, been the bottom of the ſea; that we may reaſonably ſuppoſe the deluge to have been the cauſe of all or moſt of the foſſil appearances of ſhells, bones, &c. we meet with; that our author has erred in denying to aqueous ſolution the effects which experience has ſhown it capable of producing, and in aſcribing to fuſion effects which experience doth not warrant; and that his theory, far from having any foundation in chemiſtry, is directly contradicted by that ſcience. It would be tedious and diſagreeable to proceed farther in animadverting on a theory ſo truly unphiloſophical, however elaborate and oſtentatious in a diſplay of facts: we ſhall therefore content ourſelves with taking notice of one other objection to his doctrine, of which he himſelf has been aware, with the anſwer he has given. The objection is, That there are ſometimes found flinty and cryſtalline bodies containing water: It ſeems therefore a contradiction to ſay that ſuch were produced by fuſion. To this the Doctor replies, "It muſt not be here objected, that there are frequently found ſiliceous cryſtals and amethyſts containing water; and that it is impoſſible to confine water even in melted glaſs. It is true, that here, at the ſurface of the earth, melted glaſs cannot, in ordinary circumſtances, be made to receive and incloſe condenſed water; but let us only ſuppoſe a ſufficient degree of compreſſion in the body of melted glaſs, and we can eaſily imagine it to receive and confine water as well as any other ſubſtance. But if, even in our operations, water, by means of compreſſion, may be made to endure the heat of red-hot iron without being converted into vapour, what may not the power of nature be able to perform?"

167 Final teſt of the truth of his hypotheſis.

On this reply we ſhall only obſerve, that the truth of this hypotheſis, as well as of all other parts of it, may eaſily be put to the trial by thoſe who have any of theſe cryſtals in their poſſeſſion. Let one of them be broken, and the water it contains examined. If the cryſtal has been formed by fuſion at the bottom of the ſea, as Dr Hutton ſuppoſes, it will be ſalt; if otherwiſe, freſh. As to his doctrine concerning ſubterraneous heat and volcanoes, there will be occaſion to conſider it under the article VOLCANO.

168 No ſufficient proof of extraordinary changes on the ſurface of the earth.

169 Volcanic theory.

We muſt now take into conſideration thoſe remarkable changes which are ſuppoſed to have taken place on the globe, in ſuch a manner as entirely to have altered its appearance. Theſe, however, do not appear to have any ſolid foundation. Changes, no doubt, have happened in particular parts; new iſlands have been thrown up from the bottom of the ſea by the force of ſubterraneous fire, and others have been ſwallowed up. But theſe appear to be merely the effects of volcanoes, which are common in many parts of the world; and we are not warranted to conclude, becauſe we ſee a ſmall volcanic iſland ariſe, and another ſwallowed up, that this has been the caſe with the whole habitable world.—An imperfect theory hath indeed been ſuggeſted by Sir William Hamilton, Mr Brydone, and others, concerning the uſe of volcanoes and ſubterraneous fires; from whence it might ſeem probable, though they do not indeed ſay ſo in direct terms, that all the dry land was originally thrown up from the bottom of the ſea by the force of theſe fires. Sir William Hamilton, in his letter to Dr Maty, broaches this theory in the following words. "I am myſelf convinced, that the whole circuit, ſo far as I have examined, within the boundaries marked in the map (extending at leaſt 50 Italian miles in length, and 30 in breadth where broadeſt), is wholly and totally the production of ſubterraneous fires; and that moſt probably the ſea formerly reached the mountains that lie behind Capua and Caſerta, and are a continuation of the Apennines. If I may be allowed to compare ſmall things with great, I imagine the ſubterraneous fires to have worked in this country under the bottom of the ſea, as moles in a field, throwing up here and there a hillock; and that the matter thrown out of ſome of theſe hillocks formed into ſettled volcanoes, filling up the ſpace between the one and the other, has compoſed this part of the continent, and many of the iſlands adjoining.

"From the obſervations I have made upon Mount Ætna, Veſuvius, and the neighbourhood, I dare ſay that, after a careful examination, moſt mountains that are, or have been, volcanoes, would be found to owe their exiſtence to ſubterraneous fire; the direct reverſe of what I find the commonly received opinion.—Nature, though varied, is certainly in general uniform in her operations; and I cannot conceive, that two ſuch conſiderable volcanoes as Ætna and Veſuvius, ſhould have been formed otherwiſe than every other conſiderable volcano of the known world. I do not wonder that ſo little progreſs hath been made in the improvement of natural hiſtory, and particularly in that branch of it which regards the theory of the earth: Nature acts ſlowly; it is difficult to catch her in the fact.

"From repeated obſervations I have made in the neighbourhood of Veſuvius, I am ſure that no virgin ſoil is to be found there; and that all is compoſed of different ſtrata of erupted matter, even to a great depth below the level of the ſea. In ſhort, I have not any doubt in my own mind but that this volcano took its riſe from the bottom of the ſea; and as the whole plain between Veſuvius and the mountains behind Caſerta, which is the beſt part of Campagna Felice, is (under its good ſoil) compoſed of burnt matter, I imagine the ſea to have waſhed the feet of thoſe mountains, until the ſubterraneous fires began to operate, at a period certainly of a moſt remote antiquity.

"The ſoil of the Campagna Felice is very fertile; I ſaw the earth opened in many places. The ſtratum of good ſoil was in general four or five feet thick; under which was a deep ſtratum of cinders, pumice, fragments of lava, and ſuch burnt matter as abounds near

Mount Veſuvius and all volcanoes. The mountains at the back of Caſerta are moſtly of a ſort of limeſtone, and very different from thoſe formed by fire; though Signior Van Vitelli, the celebrated architect, has aſſured me, that in the cutting of the famous aqueduct of Caſerta through theſe mountains, he met with ſome ſoils that had evidently been formed by ſubterraneous fires. The high grounds which extend from Caſtel-a-Mare to the point of Minerva towards the iſland of Caprea, and from the promontory that divides the bay of Naples from that of Salerno, are of limeſtone. The plain of Sorrento, that is bounded by theſe high grounds, beginning at the village of Vico, and ending at that of Maſſa, is wholly compoſed of the ſame ſort of tufa as that about Naples, except that the cinders or pumice-ſtones intermixed in it are larger than in the Naples tufa. I conceive, then, that there has been an exploſion in this ſpot from the bottom of the ſea. This plain, as I have remarked to be the caſe with all ſoils produced by ſubterraneous fire, is extremely fertile; whilſt the ground about it, being of another nature, is not ſo. The iſland of Caprea does not ſhow any ſigns of having been formed by ſubterraneous fire, but is of the ſame nature as the high grounds laſt mentioned; from whence it has been probably detached by earthquakes, or the violence of the waves. Rovigliano, an iſland, or rather a rock, in the bay of Caſtel-a-Mare, is likewiſe of limeſtone, and ſeems to have belonged to the original mountains in its neighbourhood: in ſome of theſe mountains alſo, there are petrified fiſh and foſſile ſhells, which I never have found in the mountains which I ſuppoſe to have been formed by exploſion. Bracini, however, in his account of the eruption of 1613, ſays, that he found many ſorts of ſea-ſhells on Veſuvius after that eruption; and P. Ignatio, in his account of the ſame eruption, ſays, that he and his companions picked up many ſhells likewiſe at that time upon the mountain: this circumſtance would induce one to believe, that the water thrown out of Veſuvius during that formidable eruption came from the ſea."

170
Inſufficiency of the volcanic theory.

This may ſerve to ſhow upon what grounds the volcanic theory ſtands: but though we ſhould admit it in its utmoſt extent, the theory of the earth can receive but very little aſſiſtance from it. Sir W. Hamilton himſelf does not ſay that all the mountains have been volcanoes, or that all the ſoil throughout the different quarters of the world hath been thrown up from the bottom of the ſea. If, therefore, there remains but one mountain in the whole world which never was a volcano, we ſhall be as much difficulted to account for the production of that one, as though there were ever ſo many; and at any rate our theory will be abſolutely uſeleſs, becauſe what will account for the origin of that mountain, will alſo account for the origin of others. If we go a ſtep beyond our author, and ſay, that there are no mountains whatever that have not been originally volcanoes, but that all the dry land is the production of ſubterraneous fire, our difficulties are ſo far from being removed, that they are greatly increaſed. The lavas and volcanic aſhes, though in time they become covered with an exceedingly fertile ſoil, remain abſolutely barren for a great number of years; inſomuch that, by the adopters of the volcanic hypotheſis, the period at which Moſes fixes the creation is reckoned by far too late to have given time for covering the many lavas of Italy and Sicily with the depth of earth they juſt now have upon them. The whole world therefore muſt have remained for many ages in a ſtate of abſolute ſterility; and by what means or in what corner of the world vegetation firſt began, remains to be inquired into.

171
Centrifugal force not the cauſe of the earth's ſpheroidal figure.

Without entering further into the theories either of Sir W. Hamilton or any other perſon, it is eaſy to ſee, that all of them are inſufficient to ſolve the difficulties mentioned n° 11. It is common to account for the ſpheroidal figure of the earth, from the greater centrifugal force of the equatorial parts than of the polar ones; but this explication can by no means be deemed ſufficient? The globe we inhabit is compoſed of two very different kinds of matter, earth and water. The former has a very conſiderable power of coheſion, beſides the gravitating power; the latter has very little coheſion, and its parts may be ſeparated from each other by whatever will overcome its weight. It follows, therefore, that the ſolid parts of the earth, reſiſting, by their coheſion, the centrifugal force more than the water, ought not to dilate ſo much. The waters of the ocean therefore ought, about the equator, to ſwell up and overflow the land; and this they ought to do at this preſent moment as much as at the firſt creation. That this ought to be the caſe, is evident from the phenomena of the tides. It is not to be doubted but that the attraction of the moon affects the ſolid earth as well as the ſea; but becauſe of the greater coheſion of the former, it cannot yield as the ocean does, and therefore the waters are raiſed to ſome height above it. Mr Whitehurſt and others indeed ſolve this difficulty by ſuppoſing the earth to have been originally fluid. But this is arguing in a circle: for if we deſire them to prove this original fluidity, they will do it by the ſpheroidal figure of the earth; and if the cauſe of the ſpheroidal figure is required, they refer us to the original fluidity. See *Whitehurſt's Inquiry*.—The height to which the waters would have covered the equatorial parts by the centrifugal force, muſt have been equal to the depreſſion at the poles; which, according to M. Buffon, is about 17 miles; according to other mathematicians, 25 or 26 miles.

172
Natural powers for preſerving the mountains.

The other difficulties are ſo totally inexplicable, that Buffon, who ſeems to exert himſelf as much as poſſible in order to remove them, is obliged at laſt to own, that the earth is in a periſhing ſtate; that the hills will be levelled, and the ocean at laſt cover the whole face of the earth; a prophecy which wears no very favourable aſpect to the inhabitants of this globe. —For theſe imaginations, however, there does not ſeem to be the ſmalleſt foundation in nature. The mountains have continued what they were, from the earlieſt accounts of time, without any ſigns of decay. Mount Ætna, beſides the waſte common to it with other mountains, hath been exhauſting itſelf by throwing out incredible quantities of its own ſubſtance; yet it ſtill ſeems to be what it was called by Pindar 2200 years ago, the *pillar of heaven*. It ſeems extremely probable, therefore, that there are powers in the ſyſtem of nature which tend to preſerve, and are capable of counteracting thoſe which tend to deſtroy, the mountains; and perhaps the late diſcovery concerning the attraction of mountains may ſome time or other throw ſome light on the nature of theſe powers. See MOUNTAIN.

173 And iſthmuſes. The like may be ſaid of the iſthmuſes or narrow necks of land which in ſome parts of the world join different countries together; ſuch as the iſthmus of Darien, of Suez, the Morea, &c. Though the ocean ſeems to beat on theſe with great violence, they are never diminiſhed in bulk, or waſhed away, as, according to Buffon's theory, they ought to be. It is plain, therefore, that there is in nature ſome power by which theſe narrow necks of land are preſerved from the fury of the ocean; for hiſtory does not afford one inſtance of any neck of land of this kind being broken down by the ſea.—It ſeems impoſſible to ſolve the difficulties with regard to the ſtrata and ſhells by any other means than ſuppoſing, that there are in the terreſtrial matter ſeveral diſtinct powers, by which the ſtrata of any particular kind are occaſionally transformed into others; and that the ſhells and other marine bodies were originally depoſited on the ſurface by the deluge. The volcanic hypotheſis, by which ſome attempt to account for the appearance of theſe bodies, will in no ſhape anſwer the purpoſe. By the exploſions of a volcano, ſhells, mud, ſand, &c. might be indiſcriminately thrown up, and ſcattered irregularly about; but we could never find the large beds of ſhells which are frequently to be met with of a conſiderable extent in different parts of the earth.

174 Notion of a chaos ought not to be adopted. With regard to any degree of certainty, it is ſcarcely to be hoped for on this ſubject. The common notion of the earth's being originally a chaos, ſeems neither to have a foundation in reaſon, nor in the Moſaic account of the creation. It is ſurely inconſiſtent with the wiſdom aſcribed to the Deity, to think that he would create this viſible ſyſtem in confuſion, and then employ it to put itſelf in order. It ſeems more probable, that the earth was originally created with the inequalities of ſurface we ſee it have, and that the natural powers for preſerving it were afterwards ſuperadded. Thus, according to Moſes, the firſt natural agent created, or produced, by directing matter to move in a certain manner, was *light*. This, we know, was abſolutely neceſſary for the evaporation of the water which took place on the ſecond day. Moſes tells us, that the earth was originally covered with water: and we ſee a natural reaſon why it ſhould be ſo; namely, that the evaporation by the atmoſphere might more eaſily take place. When this was done, there being then no more occaſion for the waters in that diffuſed ſtate, they were commanded to retire into the place appointed for them, and thus formed the ocean. Whether this was done by the action of gravity then firſt taking place, or by any other means, we have it not in our power to know, nor will our ſpeculations on this ſubject probably be attended with much benefit. We ſee, however, that the Moſaic account of the creation is perfectly conſiſtent with itſelf, and free from thoſe difficulties with which other ſyſtems are clogged. It is impoſſible to ſhow, how, by any natural power, a confuſed maſs of matter, ſuch as the chaos of the ancient poets, of Drs Burnet and Woodward, the hollow globe of Mr Hutchinſon, the comet of Mr Whiſton, or the vitrified matter of M. Buffon, could put itſelf in the order in which we ſee it. The ſacred hiſtorian ſimply tells us, that God created the heavens and the earth; that the heavens gave no light, and the earth was covered with water. He firſt commanded the light to ſhine, then the air to take up what quantity of water he thought proper for the purpoſes of vegetation. After this, the dry land was made to appear; and the different powers of vegetation already taken notice of were given to it. Next the ſun and moon were created as ſubordinate agents, to *divide the light from the darkneſs*, &c. Then followed the formation of animals and of man.

175 Moſaic account of the creation perfectly conſiſtent. According to this account, it would appear, that what we call the *laws of nature*, were given to preſerve the earth in that ſhape which the Deity thought proper to give it originally by his own power; and by no means to form it in any particular way, much leſs to put it out of the form which he had already given it: and thus the world, according to the beſt accounts we have, is very little altered in its appearance; and, according to what we can judge, will continue unaltered for ever, unleſs the Creator thinks proper to interpoſe in ſuch a manner as to ſuperſede all the laws he hath given it, and change it into ſome other form.

176 Objections to the Moſaic chronology. From ſome obſervations of Sir W. Hamilton and others, objections have been drawn, as hath been already mentioned, to the Moſaic chronology. Theſe objections are in ſubſtance as follows. In pits, and other natural and artificial openings of the ground, in the neighbourhood of Veſuvius and Ætna, ſeveral beds of lava have been diſcovered at conſiderable depths below each other. Theſe beds of lava in ſome places are covered with ſucceſſive ſtrata of vegetable mould. From this diſpoſition of materials, Sir William concludes that the world muſt have been created at a much more remote period than is generally believed. The different ſtrata of lava found below ground, he obſerves, muſt have proceeded from an equal number of eruptions from the mountain; and ſuch of them as are covered with vegetable ſoil muſt have remained at leaſt 1000 years on the ſurface before they could acquire a ſoil ſufficient for the purpoſes of vegetation. Ten or twelve ſucceſſive ſtrata overlaid with ſoil have already been diſcovered in the bowels of the earth; and it has been ſtrongly aſſerted, that, by digging deeper, many more might have been found. Now, allowing 1000 years for each ſtratum of lava, which the ſupporters of this theory affirm to be too little, the antiquity of the earth cannot be leſs than 12,000 years, which is more than double its age according to the Moſaic account.

The principal fact in this theory is, that 1000 years are neceſſary to the production of a ſoil ſufficient for the nouriſhment and growth of vegetables upon volcanic lavas. This notion is confirmed by a conjecture of the Canonico Recupero, that ſtreams of lava in Sicily have lain for centuries without acquiring a vegetable mould; and by ſome obſcure accounts, that theſe lavas have proceeded from eruptions of Ætna above 1000 years ago. The following conſiderations, however, will render this theory at leaſt extremely dubious.

177 Anſwered. Sir William informs us, that ſome lavas are very ſolid, and reſiſt the operation of time much longer than another kind, which, he ſays, "is farinaceous, the particles ſeparating as they force their way out, juſt like

meal coming from under the grindſtones. A ſtream of lava of this ſort (he juſtly obſerves), being leſs compact, and containing more earthy particles, would certainly be much ſooner fit for vegetation than one compoſed of the more perfect vitrified matter." He has not, however, ventured to determine whether theſe lavas found below ground were of the former or latter quality; a circumſtance which materially affects the juſtneſs of his calculation.

That ſoil gradually increaſes by decayed vegetables, and the ſediment depoſited by ſnow and rain, is an undeniable fact. The thickneſs or thinneſs of ſoil indicates a greater or leſs time of accumulation. But Sir William has not informed us of the dimenſions of his ſubterraneous vegetable ſtrata; a circumſtance of great moment in inſtituting a calculation of their different eras.

Beſides, eruptions of volcanoes are often accompanied with incredible quantities of aſhes, which fall thick upon all the ground for many miles round; intended by nature, it would appear, quickly to repair the barrenneſs occaſioned by the lava. The muddy water ſometimes thrown out may co-operate powerfully with the aſhes in producing the ſame happy effect.

But Sir William has furniſhed us with facts of a more important nature. The town of Herculaneum was deſtroyed by an eruption in the 97th year of the Chriſtian era. There are evident marks, ſays he, that the matter of ſix eruptions has taken its courſe over Herculaneum; for each of the ſix ſtrata of lava is covered with a vein of good ſoil. Here we have Sir William's own authority for ſix ſtrata of *good ſoil*, accumulated in leſs than 1700 years; which, ſuppoſing them to be all of equal thickneſs, inſtead of 1000 years, leaves not 300 to the production of each.

From the ſame authority we learn, that the crater on the top of the Monte Nuovo, or New Mountain, which was thrown up by ſubterraneous fire no farther back than the year 1538, is now covered with ſhrubs.

There is not on record any eruption from the great crater of Veſuvius from the year 1139 to 1631, a period of only 492 years. But Bracini, who deſcended into it not long before the 1631, tells us, "that the crater was five miles in circumference, and about 1000 paces deep. Its ſides were covered with bruſhwood, and at the bottom there was a plain on which cattle grazed. In the woody parts, bears frequently harboured," &c.

The correſpondence of theſe facts, related by Sir William himſelf, with his favourite notion that 1000 years are neceſſary for the production of a vegetable ſoil, we leave to the reader's conſideration; and ſhall conclude with a few remarks of a different kind.

The appearance of a ſtratum of lava below ground, though not covered with vegetable ſoil, our author conſiders as demonſtrative evidence, that ſuch ſtratum formerly lay above the ſurface, and was thrown out by an eruption. This inference, however, ſeems not altogether juſt. Nothing, with propriety, receives the denomination of an eruption, unleſs when lava or other matter is vomited from the crater, or from ſome new opening made in the mountain. But it deſerves notice, that, in the environs of volcanoes, earthquakes are frequent. That theſe violent concuſſions are the genuine produce of ſubterraneous fire expanding itſelf in every direction, and making ſtrong efforts againſt every ſubſtance which reſiſts the natural tendency of its courſe, is a fact that cannot admit of doubt. It is no leſs certain, that theſe frequent concuſſions ſhake and diſlocate the internal parts of the earth. They cannot fail to ſhatter and diſarrange the natural direction of the original ſtrata; and, of courſe, they muſt give riſe to many ſubterraneous cavities and fiſſures. The nearer the great furnace, which confines the fury of the flames, the greater and more frequent will be the cavities. Every earthquake occaſioned by a volcano is nothing elſe than an effort of the burning matter to enlarge the boundaries by which it is uſually limited. If the quantity of matter and degree of inflammation require a ſpace greatly ſuperior to the internal cavities, an eruption above the ſurface is an infallible conſequence: but when the quantity of matter, or the expanſive force occaſioned by the degree of inflammation, is inſufficient to raiſe the lava to the top of the mountain, an earthquake may be produced; and the lava, without ever appearing above the ſurface, may run below ground in plentiful ſtreams, and fill up all the ſubterraneous cavities and channels. Theſe internal ſtrata of lava may often lie ſo deep as to be below the level of the ſea. In this manner, we conceive it to be not only poſſible, but extremely probable, that beds of lava, having no covering of vegetable ſoil, may be found at great depths, although they never were above the ſurface.

It is much more reaſonable to conclude, that lavas with a layer of ſoil were produced by eruptions, and once lay above the ſurface, till covered by the operation of time, or ſubſequent ſtreams from the mouth of the volcano. But even in this caſe, the argument is not altogether complete; for, as above remarked, earthquakes, with which countries adjacent to volcanoes are perpetually infeſted, often ſink large tracts of land to great depths.

The other parts of the theory of the earth regard the ſituation of the different parts of its ſurface with reſpect to each other; its annual motion round the ſun as a planet; its diurnal motion round its axis; and the different ſtrata whereof it is compoſed, as far as it hath been hitherto found practicable to penetrate into it: for all which, ſee the articles GEOGRAPHY, ASTRONOMY, MINES, STRATA, &c.

Smell and Bath of the EARTH. See AGRICULTURE, n° 10.

Bread made of EARTH. See BREAD.

EARTH-*Flax*. See AMIANTHUS.

EARTH-*Nuts*, or *Ground-Nuts*, the roots of the ARACHIS hypogæa of Linnæus. They are compoſed of ſeveral ſmall round bulbs or knobs; whence they were termed by Dodonæus, *terræ glandes* or *earth-nuts*. They are eſteemed an excellent food by the Siberians. In Holland likewiſe, they are ſold in the markets and uſed for food. The native country of this plant ſeems to be Africa; though, at preſent, all the American ſettlements abound with it; but many perſons who have reſided in that country affirm that they were originally brought by the ſlaves from Africa. The plant multiplies very faſt in a warm country; but being very impatient of cold, it cannot be propagated in the open air in Britain. The ſeeds muſt therefore be planted in a hot-bed in the ſpring of the year; and when the weather proves warm, they may be expoſed to the open air by degrees. The branches of the plant trail upon the ground; and the flowers, which are yellow, are produced ſingle upon long footſtalks; and as ſoon as the flower begins to decay, the germen is thruſt under ground, where the pod is formed and ripened; ſo that unleſs the ground is opened, they never appear: the roots are annual, but the nuts or ſeeds ſufficiently ſtock the ground in a warm country where they are not carefully taken up.

Earth-Nuts, or *Pig-Nuts*. See Bunium.

Earth-Pucerons, in natural hiſtory, a name given by authors to a ſpecies of puceron very ſingular in its place of abode. In the month of March, if the turf be raiſed in ſeveral places in any dry paſture, there will be found, under ſome parts of it, cluſters of ants; and, on a farther ſearch, it will be uſually found, that theſe animals are gathered about ſome pucerons of a peculiar ſpecies. Theſe are large, and of a greyiſh colour, and are uſually found in the midſt of the cluſters of ants.

The common abode of the ſeveral other ſpecies of pucerons is on the young branches or leaves of trees; as their only food is the ſap or juice of vegetables, probably theſe *earth* kinds draw out thoſe juices from the roots of the graſſes, and other plants, in the ſame manner that the others do from the other parts. The ants that conduct us to theſe, are alſo our guides where to find the greater part of the others: the reaſon of which is, that as theſe creatures feed on the ſaccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original ſtate; and the ants, who love ſuch food, find it ready prepared for them in the excrements which theſe little animals are continually voiding *. It has been ſuppoſed by ſome, that theſe were the common pucerons of other kinds, which had crept into the earth to preſerve themſelves from the rigour of the winter. But this does not appear to be the caſe; for they are uſually met with in places very diſtant from trees or plants, on which they ſhould be ſuppoſed before to have fed; and it is very certain, that though many of theſe inſects are killed by the cold, yet many eſcape, and are found very early in the ſpring, ſucking the buds of the peach-tree. There is no doubt of theſe creatures being in a feeding condition when under ground; becauſe otherwiſe the ants would have no temptation to follow them: and it is equally certain, that the ſeveral ſpecies of the pucerons, like thoſe of the caterpillar kinds, have each their peculiar herbs on which they feed, as many of them will die of hunger rather than feed on any others; and it is not at all likely, that theſe earth pucerons had been uſed to feed on leaves of trees and plants, and had left that food for the roots of graſs.

* See *Aphis*, and *Honey-dew*.

Earth-Worms. See Lumbricus.

EARTHQUAKE, in natural hiſtory, a ſudden and violent concuſſion of the earth, generally attended with ſtrange noiſes under-ground or in the air; often deſtroying whole cities at once, throwing down rocks, altering the courſe of rivers, and producing the moſt terrible devaſtations.

1
What countries are moſt ſubject to earthquakes.

Though there is hardly any country known in which ſhocks of an earthquake have not at ſome time or other been felt, yet there are ſome much more ſubject to them than others. It hath been obſerved, that northern countries in general are leſs ſubject to earthquakes than thoſe ſituated near the equator, or in the ſouthern latitudes; but this does not hold univerſally. The iſlands of Japan, which are ſituated pretty far north, are nevertheleſs exceedingly liable to theſe deſtructive phenomena. Iſlands, in general, are alſo more ſubject to earthquakes than continents; but neither does this hold without exceptions. Some particular parts of continents, and ſome particular iſlands, are more ſubject to them than others lying in the neighbourhood, and differing very little from them in external appearance. Thus, Portugal is more ſubject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamaica more than the other Caribbee iſlands. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly deſtructive. Aſia Minor has been remarkably ſubject to them from the remoteſt antiquity; and the city of Antioch in particular hath ſuffered more from earthquakes than any other in that country. The ſame phenomena are ſaid alſo to occur very frequently in the north-eaſtern extremities of Aſia, even in very high latitudes.

2
Hiſtory of their phenomena incomplete.

Though there are no phenomena in nature more calculated to impreſs the human mind with terror, and conſequently to be well remembered and taken notice of, than earthquakes; yet the philoſophy of them is but lately arrived at any degree of perfection; and even at this day, the hiſtory of earthquakes is very incomplete. The deſtruction occaſioned by them engroſſes the mind too much to admit of philoſophical ſpeculations at the time they happen: the ſame thing prevents the attentive conſideration of the alterations that take place in the atmoſphere after the earthquake is over, and which might probably throw ſome light on the cauſes which produced it; and the ſuddenneſs of its coming on prevents an exact attention to thoſe ſlight appearances in the earth or air, which, if carefully obſerved, might ſerve as warnings to avoid the deſtruction.—From what obſervations have been made, however, the following phenomena may be deduced, and reckoned pretty certain.

3
Account of the phenomena as far as yet aſcertained.

1. Where there are any volcanoes or burning mountains, earthquakes may reaſonably be expected more frequently than in other countries.

2. If the volcano hath been for a long time quiet, a violent earthquake is to be feared, & *vice verſa*. But to this there are many exceptions.

3. Earthquakes are generally preceded by long droughts; but they do not always come on as ſoon as the drought ceaſes.

4. They are alſo preceded by electrical appearances in the air; ſuch as the aurora borealis, falling ſtars, &c.: but this does not hold univerſally.

5. A ſhort time before the ſhock, the ſea ſwells up and makes a great noiſe; fountains are troubled, and ſend forth muddy water; and the beaſts ſeem frighted, as if ſenſible of an approaching calamity.

6. The air at the time of the ſhock is generally calm and ſerene; but afterwards commonly becomes obſcure and cloudy.

7. The ſhock comes on with a rumbling noiſe, ſometimes like that of carriages; ſometimes a ruſhing noiſe like wind, and ſometimes exploſions like the firing of cannon are heard. Sometimes the ground heaves perpendicularly upwards, and ſometimes rolls from ſide to ſide. Sometimes the ſhock begins with a perpendicular heave, after which the other kind of motion commences. A ſingle ſhock is but of very ſhort duration, the longeſt ſcarcely laſting a minute; but they frequently ſucceed each other at ſhort intervals for a conſiderable length of time.

8. During the ſhock, chaſms are made in the earth; from which ſometimes flames, but oftener great quantities of water, are diſcharged. Flame and ſmoke are alſo emitted from places of the earth where no chaſms can be perceived. Sometimes theſe chaſms are but ſmall; but, in violent earthquakes, they are frequently ſo large, that whole cities ſink down into them at once.

9. The water of the ocean is affected even more than the dry-land. The ſea ſwells to a prodigious height; much more than we could ſuppoſe it raiſed by the mere elevation of its bottom by the ſhock. Sometimes it is divided to a conſiderable depth; and great quantities of air, flames, and ſmoke, are diſcharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers.

10. The ſhock is felt at ſea as well as on land. Ships are affected by a ſudden ſtroke, as if they had run aground or ſtruck upon a rock.

11. The effects of earthquakes are not confined to one particular diſtrict or country, but often extend to very diſtant regions; though no earthquake hath yet been known extenſive enough to affect the whole globe at one time. In thoſe places alſo where the ſhock is not felt on dry land, the irregular agitation of the waters above mentioned is perceived very remarkably.

4
Account of the earth- uake in amaica in 692.

All theſe poſitions are verified by the accounts of thoſe earthquakes which have been particularly deſcribed by witneſſes of the beſt character. In 1692, an earthquake happened in Jamaica, attended with almoſt all the terrible circumſtances above mentioned. In two minutes, it deſtroyed the town of Port Royal, at that time the capital of the iſland; and ſunk the houſes in a gulph 40 fathoms deep. It was attended with an hollow rumbling noiſe like that of thunder: the ſtreets roſe like the waves of the ſea; firſt lifting up the houſes, and then immediately throwing them down into deep pits. All the wells diſcharged their waters with the moſt violent agitation. The ſea burſt over its bounds, and deluged all that ſtood in its way. The fiſſures of the earth were in ſome places ſo great, that one of the ſtreets appeared twice as broad as formerly. In many places it opened and cloſed again; and continued this agitation for ſome time. Of theſe openings, great numbers might be ſeen at once. In ſome of them, the people were ſwallowed up at once; in others, the earth caught them by the middle, and cruſhed them to death; while others, more fortunate, were ſwallowed up in one chaſm, and thrown out alive by another. Other chaſms were large enough to ſwallow up whole ſtreets; and others, ſtill more formidable, ſpouted up immenſe quantities of water, drowning ſuch as the earthquake had ſpared. The whole was attended with ſtenches and offenſive ſmells, the noiſe of falling mountains at a diſtance, &c.; and the ſky, in a minute's time, was turned dull and reddiſh, like a glowing oven. Yet, as great a ſufferer as Port-Royal was, more houſes were left ſtanding therein than on the whole iſland beſides. Scarce a planting-houſe, or ſugar-houſe, was left ſtanding in all Jamaica. A great part of them were ſwallowed up, houſes, people, trees, and all, in one gap: in lieu of which, afterwards appeared great pools of water; which, when dried up, left nothing but ſand, without any mark that ever tree or plant had grown thereon. The ſhock was ſo violent, that it threw people down on their knees or their faces as they were running about for ſhelter. Several houſes were ſhuffled ſome yards out of their places, and yet continued ſtanding. One Hopkins had his plantation removed half a mile from the place where it ſtood, without any conſiderable alteration. All the wells in the iſland, as well as thoſe of Port-Royal, from one fathom to ſix or ſeven deep, threw their water out at the top with great violence. Above 12 miles from the ſea, the earth gaped and ſpouted out, with a prodigious force, vaſt quantities of water into the air: yet the greateſt violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains, the greater the ſhock; and that the cauſe thereof lay among them. Moſt of the rivers were ſtopped up for 24 hours by the falling of the mountains; till ſwelling up, they made themſelves new tracks and channels; tearing up, in their paſſage, trees, &c. After the great ſhock, thoſe people who eſcaped got on board ſhips in the harbour, where many continued above two months; the ſhocks all that time being ſo violent, and coming ſo thick, ſometimes two or three in an hour, accompanied with frightful noiſes like a ruſhing wind, or a hollow rumbling thunder, with brimſtone-blaſts, that they durſt not come aſhore. The conſequence of the earthquake was a general ſickneſs, from the noiſome vapours belched forth, which ſwept away above 3000 perſons.

5
Of the earthquake in Calabria in 1638.

A ſtill more terrible account, if poſſible, is that given by Kircher, of the earthquake which happened in Calabria in the year 1638. This inſtance is an exception to the ſecond general poſition above laid down. In Italy, there had been an eruption of Mount Veſuvius five years before; and in Sicily there had been an eruption of Ætna only two years before this earthquake. The event, however, plainly ſhowed, that the cauſe of the earthquake, whatever it was, had a connection not only with Mount Ætna, which lies in the neighbourhood, but alſo with the volcano of Stromboli, which is 60 miles diſtant. "On the 24th of March (ſays Kircher), we lanched (in a ſmall boat) from the harbour of Meſſina in Sicily, and arrived the ſame day at the promontory of Pelorus. Our deſtination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we reſolved to proſecute our voyage; and although the ſea ſeemed more than uſually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, ſeemed whirled round in ſuch a manner as to form a vaſt hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount Ætna, I ſaw it caſt forth large volumes of ſmoke, of mountainous ſize, which entirely covered the iſland, and blotted out even the ſhores from my view. This, together with the dreadful noiſe, and the ſulphureous ſtench, which was ſtrongly perceived, filled me with apprehenſions that ſome more dreadful calamity was impending. The ſea itſelf ſeemed to wear a very unuſual appearance; thoſe who have ſeen a lake in a violent ſhower of rain all covered over with bubbles, will have ſome idea of its agitations. My ſurpriſe was ſtill increaſed by the calmneſs and ſerenity of the weather; not a breeze, not a cloud, which might be ſuppoſed to put all nature thus into motion. I therefore warned my companion, that an earthquake was approaching; and, after ſome time, making for the ſhore with all poſſible diligence, we landed at Tropæa. But we had ſcarce arrived at the Jeſuits college in that city, when our ears were ſtunned with an horrid ſound, reſembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a moſt dreadful earthquake enſued; ſo that the whole track upon which we ſtood ſeemed to vibrate, as if we were in the ſcale of a balance that continued waving. This motion, however, ſoon grew more violent; and being no longer able to keep my legs, I was thrown proſtrate upon the ground. After ſome time, finding that I remained unhurt amidſt the general concuſſion, I reſolved to venture for ſafety; and running as faſt as I could, reached the ſhore. I did not ſearch long here, till I found the boat in which I had landed, and my companions alſo. Leaving this ſeat of deſolation, we proſecuted our voyage along the coaſt; and the next day came to Rochetta, where we landed, although the earth ſtill continued in violent agitations. But we were ſcarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we ſaw the greateſt part of the town, and the inn at which we had ſet up, daſhed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little veſſel, we at length landed at Lopizium, a caſtle mid-way between Tropæa and Euphemia the city to which we were bound. Here, wherever I turned my eyes, nothing but ſcenes of ruin and horror appeared; towns and caſtles levelled to the ground; Stromboli, though at 60 miles diſtance, belching forth flames in an unuſual manner, and with a noiſe which I could diſtinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling ſound of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the conſequences. It every moment ſeemed to grow louder, and to approach more near. The place on which we ſtood now began to ſhake moſt dreadfully; ſo that, being unable to ſtand, my companions and I caught hold of whatever ſhrub grew next us, and ſupported ourſelves in that manner. After ſome time, the violent paroxyſm ceaſing, we again ſtood up, in order to proſecute our voyage to Euphemia, which lay within ſight. In the mean time, while we were preparing for this purpoſe, I turned my eyes towards the city; but could ſee only a frightful dark cloud, that ſeemed to reſt upon the place. This the more ſurpriſed us, as the weather was ſo very ſerene. We waited, therefore, till the cloud was paſſed away: then turning to look for the city, it was totally ſunk; and nothing but a diſmal and putrid lake was to be ſeen where it ſtood."

6
Of the earthquake in Sicily in 1693.

In 1693 an earthquake happened in Sicily, which may juſtly be accounted one of the moſt terrible of which we have any account. It ſhook the whole iſland: and not only that, but Naples and Malta ſhared in the ſhock. It was impoſſible for any body in this country to keep on their legs on the dancing earth; nay, thoſe that lay on the ground were toſſed from ſide to ſide as on a rolling billow: high walls leaped from their foundations ſeveral paces, &c. The miſchief it did is amazing; almoſt all the buildings in the countries were thrown down. Fifty-four cities and towns, beſide an incredible number of villages, were either deſtroyed or greatly damaged. We ſhall only inſtance the fate of Catania, one of the moſt famous, ancient, and flouriſhing cities in the kingdom; the reſidence of ſeveral monarchs, and an univerſity. This once famous city had the greateſt ſhare in the tragedy. Father Anthon. Serrovita, being on his way thither, and at the diſtance of a few miles, obſerved a black cloud like night hovering over the city; and there aroſe from the mouth of Montgibello great ſpires of flame, which ſpread all around. The ſea all of a ſudden began to roar and riſe in billows; and there was a blow, as if all the artillery in the world had been at once diſcharged. The birds flew about aſtoniſhed; the cattle in the fields ran crying, &c. His and his companions horſes ſtopped ſhort, trembling; ſo that they were forced to alight. They were no ſooner off, but they were lifted from the ground above two palms; when caſting his eyes towards Catania, he with amazement ſaw nothing but a thick cloud of duſt in the air. This was the ſcene of their calamity; for of the magnificent Catania, there was not the leaſt footſtep to be ſeen. S. Bonajutus aſſures us, that of 18900 inhabitants, 18000 periſhed therein.

7
Phenomena of the great earthquake, Novem. 1. 1755.

8
At Liſbon.

The great earthquake, however, which happened on the 1ſt of November 1755, affords the cleareſt example of all the phenomena above mentioned; having been felt violently in many places both on land and at ſea, and extended its effects to the waters in many other places where the ſhocks were not perceived. At Liſbon in Portugal its effects were moſt ſevere. In 1750, there had been a ſenſible trembling of the earth felt in this city: for four years afterwards, there had been an exceſſive drought; inſomuch that ſome ſprings, formerly very plentiful of water, were dried and totally loſt. The predominant winds were north and north-eaſt, accompanied with various, though very ſmall, tremors of the earth. The year 1755 proved very wet and rainy; the ſummer cooler than uſual; and for 40 days before the earthquake, the weather was clear, but not remarkably ſo. The laſt day of October, the ſun was obſcured, with a remarkable gloomineſs in the atmoſphere. The firſt of November, early in the morning, a thick fog aroſe, which was ſoon diſſipated by the heat of the ſun; no wind was ſtirring; the ſea was calm; and the weather as warm as in June or July in this country. At 35 minutes after nine, without the leaſt warning, except a rumbling noiſe not unlike the artificial thunder in our theatres, a moſt dreadful earthquake ſhook, by ſhort but quick vibrations, the foundations of all the city, ſo that many buildings inſtantly fell. Then, with a ſcarce perceptible pauſe, the nature of the motion was changed, and the houſes were toſſed from ſide to ſide, with a motion like that of a waggon violently driven over rough ſtones. This ſecond ſhock laid almoſt the whole city in ruins, with prodigious ſlaughter of the people. The earthquake laſted in all about ſix minutes. At the moment of its beginning, ſome perſons on the river, near a mile from the city, heard their boat make a noiſe as if it had run aground, though they were then in deep water; and at the ſame time they ſaw the houſes falling on both ſides of the river. The bed of the river Tagus was in many places raiſed to its ſurface. Ships were driven from their anchors, and joſtled together with great violence; nor did their maſters know whether they were afloat or aground. A large new quay ſunk to an unfathomable depth, with ſeveral hundreds of people who were upon it; nor was one of the dead bodies ever found. The bar was at firſt ſeen dry from ſhore to ſhore: but ſuddenly the ſea came rolling in like a mountain; and about Belem Caſtle the water roſe 50 feet almoſt in an inſtant. About noon there was another ſhock; when the walls of ſeveral houſes that yet remained were ſeen to open from top to bottom more than a quarter of a yard, and afterwards cloſed again ſo exactly that ſcarce any mark of the injury was left.

9 At Colares. At Colares, about 20 miles from Liſbon, and two miles from the ſea, on the laſt day of October, the weather was clear, and uncommonly warm for the ſeaſon. About four o'clock in the afternoon there aroſe a fog, which came from the ſea, and covered the valleys; a thing very unuſual at that ſeaſon of the year. Soon after, the wind changing to the eaſt, the fog returned to the ſea, collecting itſelf, and becoming exceeding thick. As the fog retired, the ſea roſe with a prodigious roaring. The firſt of November, the day broke with a ſerene ſky, the wind continuing at eaſt; but about nine o'clock the ſun began to grow dim; and about half an hour after was heard a rumbling noiſe like that of chariots, which increaſed to ſuch a degree, that it became equal to the exploſions of the largeſt cannon. Immediately a ſhock of an earthquake was felt, which was quickly ſucceeded by a ſecond and third; and at the ſame time ſeveral light flames of fire iſſued from the mountains, reſembling the kindling of charcoal. In theſe three ſhocks, the walls of the buildings moved from eaſt to weſt. In another ſituation, from whence the ſea-coaſt could be diſcovered, there iſſued from one of the hills called the *Fojo* a great quantity of ſmoke, very thick, but not very black. This ſtill increaſed with the fourth ſhock, and afterwards continued to iſſue in a greater or leſs degree. Juſt as the ſubterraneous rumblings were heard, the ſmoke was obſerved to burſt forth at the Fojo; and the quantity of ſmoke was always proportioned to the noiſe. On viſiting the place from whence the ſmoke was ſeen to ariſe, no ſigns of fire could be perceived near it.

10 At Oporto. At Oporto (near the mouth of the river Douro), the earthquake began about 40 minutes paſt nine. The ſky was very ſerene; when a dreadful hollow noiſe like thunder, or the rattling of coaches at a diſtance, was heard, and almoſt at the ſame inſtant the earth began to ſhake. In the ſpace of a minute or two, the river roſe and fell five or ſix feet, and continued to do ſo for four hours. It ran up at firſt with ſo much violence, that it broke a ſhip's hawſer. In ſome parts the river opened, and ſeemed to diſcharge vaſt quantities of air; and the agitation in the ſea was ſo great about a league beyond the bar, that air was ſuppoſed to have been diſcharged there alſo.

11 At St Ube's. St Ube's, a ſea-port town about 20 miles ſouth of Liſbon, was entirely ſwallowed up by the repeated ſhocks and the vaſt ſurf of the ſea. Huge pieces of rock were detached at the ſame time from the promontory at the weſt end of the town, which conſiſts of a chain of mountains containing fine jaſper of different colours.

12 At Ayamonte in Spain. The ſame earthquake was felt all over Spain, except in Catalonia, Arragon, and Valencia.—At Ayamonte (near where the Guadiana falls into the Bay of Cadiz), a little before 10 o'clock on the firſt of November, the earthquake was felt; having been immediately preceded by a hollow ruſhing noiſe. Here the ſhocks continued for 14 or 15 minutes, damaged almoſt all the buildings, throwing down ſome, and leaving others irreparably ſhattered. In little more than half an hour after, the ſea and river, with all the canals, overflowed their banks with great violence, laying under water all the coaſts of the iſlands adjacent to the city and its neighbourhood, and flowing into the very ſtreets. The water came on in vaſt black mountains, white with foam at the top, and demoliſhed more than one half of a tower at the bar named *De Canala*. In the adjacent ſtrands every thing was irrecoverably loſt; for all that was overflowed ſunk, and the beach became a ſea, without the leaſt reſemblance of what it was before. Many perſons periſhed; for although they got aboard ſome veſſels, yet part of theſe foundered; and others being forced out to ſea, the unhappy paſſengers were ſo terrified, that they threw themſelves overboard. The day was ſerene, and not a breath of wind ſtirring.

13 At Cadiz. At Cadiz, ſome minutes after nine in the morning, the earthquake began, and laſted about five minutes. The water of the ciſterns under ground waſhed backwards and forwards, ſo that a great froth aroſe. At ten minutes after eleven, a wave was ſeen coming from the ſea, at eight miles diſtance, at leaſt 60 feet higher than uſual. It daſhed againſt the weſt part of the town, which is very rocky. Though theſe rocks broke a good deal of its force, it at laſt came upon the city walls, beat in the breaſt-work, and carried pieces of the building of eight or ten ton weight to the diſtance of 40 or 50 yards.—When the wave was gone, ſome parts that are deep at low water, were left quite dry; for the water returned with the ſame violence with which it came. At half an hour after 11 came a ſecond wave, and after that four other remarkable ones; the firſt at ten minutes before twelve; the ſecond, half an hour before one; the third, ten minutes after one; and the fourth, ten minutes before two. Similar waves, but ſmaller, and gradually leſſening, continued with uncertain intervals till the evening.

14 At Gibraltar. At Gibraltar, the earthquake was not felt till after ten. It began with a tremulous motion of the earth, which laſted about half a minute. Then followed a violent ſhock; after that, a trembling of the earth for five or ſix ſeconds; then another ſhock not ſo violent as the firſt, which went off gradually as it began. The whole laſted about two minutes. Some of the guns on the battery were ſeen to riſe, others to ſink, the earth having an undulating motion. Moſt people were ſeized with giddineſs and ſickneſs, and ſome fell down; others

Earthquake.

were ſtupified; and many that were walking or riding felt no motion in the earth, but were ſick. The ſea roſe ſix feet every 15 minutes; and then fell ſo low, that boats and all the ſmall craft near the ſhore were left aground, as were alſo numbers of ſmall fiſh. The flux and reflux laſted till next morning, having decreaſed gradually from two in the afternoon.

15 At Madrid, Malaga, &c.

At Madrid the earthquake came on at the ſame time as at Gibraltar, and laſted about ſix minutes. At firſt every body thought they were ſeized with a ſwimming in their heads; and afterwards, that the houſes were falling. It was not felt in coaches, nor by thoſe who walked on foot, except very ſlightly; and no accident happened, except that two lads were killed by the fall of a ſtone-croſs from the porch of a church.

Malaga (a ſea-port on the Mediterranean) felt a violent ſhock; the bells rung in the ſteeples; the water of a well overflowed, and as ſuddenly retired.

Saint Lucar (at the mouth of the Guadalquivir) was violently ſhocked, and the ſea broke in and did a great deal of miſchief.

At Seville (16 leagues above the mouth of the Guadalquivir) ſeveral houſes were ſhaken down; the famous tower of the cathedral called *La Giralda* opened in the four ſides; and the waters were ſo violently agitated, that all the veſſels in the river were driven aſhore.

16 At Arzilla in Africa.

In Africa, the earthquake was felt almoſt as ſeverely as it had been in Europe. Great part of the town of Algiers was deſtroyed. At Arzilla (a town in the kingdom of Fez), about ten in the morning, the ſea ſuddenly roſe with ſuch impetuoſity, that it lifted up a veſſel in the bay, and dropped it with ſuch force on the land, that it was broke to pieces; and a boat was found two muſket-ſhot within land from the ſea. At Fez and Mequinez, great numbers of houſes fell down, and a multitude of people were buried in the ruins.

17 At Morocco.

At Morocco, by the falling down of a great number of houſes, many people loſt their lives: and about eight leagues from the city the earth opened and ſwallowed up a village with all the inhabitants, who were known by the name of the *Sons of Beſumba*, to the number of about 8000 or 10,000 perſons, together with all their cattle, &c.; and, ſoon after, the earth cloſed again in the ſame manner as before.

18 At other places on the African coaſt.

At Salle, a great deal of damage was done. Near a third part of the houſes were overthrown; the waters ruſhed into the city with great rapidity, and left behind them great quantities of fiſh.

At Tangier, the earthquake began at ten in the morning, and laſted 10 or 12 minutes. The ſea came up to the walls (a thing never heard of before); and went down immediately with the ſame rapidity with which it aroſe, leaving a great quantity of fiſh behind it. Theſe commotions were repeated 18 times, and laſted till ſix in the evening.

At Tetuan, the earthquake began at the ſame time it did at Tangier, but laſted only ſeven or eight minutes. There were three ſhocks ſo extremely violent, that it was feared the whole city would be deſtroyed.

19 In the iſland of Madeira.

In the city of Funchal, in the iſland of Madeira, a ſhock of this earthquake was firſt perceived at 38 minutes paſt nine in the morning. It was preceded by a rumbling noiſe in the air, like that of empty carriages paſſing haſtily over a ſtone pavement. The obſerver felt the floor immediately to move with a tremulous motion, vibrating very quickly. The ſhock continued more than a minute; during which ſpace, the vibrations, though continual, were weakened and increaſed in force twice very ſenſibly. The increaſe after the firſt remiſſion of the ſhock was the moſt intenſe. The noiſe in the air accompanied the ſhock during the whole of its continuance, and laſted ſome ſeconds after the motion of the earth had ceaſed; dying away like a peal of diſtant thunder rolling through the air. At three quarters paſt eleven, the ſea, which was quite calm, it being a fine day, and no wind ſtirring, retired ſuddenly ſome paces; then riſing with a great ſwell without the leaſt noiſe, and as ſuddenly advancing, overflowed the ſhore, and entered the city. It roſe 15 feet perpendicular above the high-water mark, although the tide, which flows there ſeven feet, was then at half ebb. The water immediately receded; and after having fluctuated four or five times between high and low water mark, it ſubſided, and the ſea remained calm as before. In the northern part of the iſland the inundation was more violent, the ſea there retiring above 100 paces at firſt, and ſuddenly returning, overflowed the ſhore, forcing open doors, breaking down the walls of ſeveral magazines and ſtorehouſes, leaving great quantities of fiſh aſhore and in the ſtreets of the village of Machico. All this was the effect of one riſing of the ſea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it ſubſided than at Funchal; and in ſome places farther to the weſtward, it was hardly, if it all, perceptible.

20 Effects of it in Norway and Sweden.

Theſe were the phenomena with which this remarkable earthquake was attended in thoſe places where it was violent. The effects of it, however, reached to an immenſe diſtance; and were perceived chiefly by the agitations of the waters, or ſome ſlight motion of the earth. The utmoſt boundaries of this earthquake to the ſouth are unknown; the barbarity of the African nations rendering it impoſſible to procure any intelligence from them, except where the effects were dreadful. On the north, however, we are aſſured, that it reached as far as Norway and Sweden. In the former, the waters of ſeveral rivers and lakes were violently agitated. In the latter, ſhocks were felt in ſeveral provinces, and all the rivers and lakes were ſtrongly agitated, eſpecially in Dalecarlia. The river Dala ſuddenly overflowed its banks, and as ſuddenly retired. At the ſame time a lake at the diſtance of a league from it, and which had no manner of communication with it, bubbled up with great violence. At Fahlun, a town in Dalecarlia, ſeveral ſtrong ſhocks were felt.

21 In Germany.

In many places of Germany the effects of the earthquake were very perceptible. Throughout the duchy of Holſtein, the waters were violently agitated, particularly thoſe of the Elbe and Trave. In Brandenburg, the water of a lake called *Libſec*, ebbed and flowed ſix times in half an hour, with a dreadful noiſe, the weather being then perfectly calm. The ſame agitation was obſerved in the waters of the lakes called *Muplgaſt* and *Netzo*; but at this laſt place they alſo emitted an intolerable ſtench.

22 In Holland.

In Holland, the agitations were more remarkable.

At Alphen on the Rhine between Leyden and Woerden, in the afternoon of the firſt of November, the waters were agitated to ſuch a violent degree, that buoys were broken from their chains, large veſſels ſnapped their cables, ſmaller ones were thrown out of the water upon the land, and others lying on land were ſet afloat. At Amſterdam, about eleven in the forenoon, the air being perfectly calm, the waters were ſuddenly agitated in their canals, ſo that ſeveral boats broke looſe; chandeliers were obſerved to vibrate in the churches; but no motion of the earth, or concuſſion of any building, was obſerved. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but alſo all kinds of fluids in ſmaller quantities, as in coolers, tubs, backs, &c. were ſurpriſingly agitated, and daſhed over the ſides, though no motion was perceptible in the veſſels themſelves. In theſe ſmall quantities alſo the fluid apparently aſcended prior to its turbulent motion; and in many places, even the rivers and canals roſe 12 inches perpendicular. At Leyden, between half an hour after 10 and 11 in the forenoon, the waters roſe ſuddenly in ſome of the canals, and made ſeveral very ſenſible undulations, ſo that the boats were ſtrongly agitated. The ſame motion was perceived in the water of the backs of two brew-houſes.

Round the iſland of Corſica, the ſea was violently agitated, and moſt of the rivers of the iſland overflowed their banks.—In the city of Milan in Italy, and throughout that diſtrict, ſhocks were felt. At Turin in Savoy, there was felt a very violent ſhock.

23
In Italy and Switzerland.

In Switzerland, many rivers turned ſuddenly muddy without rain. The lake of Neufchatel ſwelled to the height of near two feet above its natural level for the ſpace of a few hours. An agitation was alſo perceived in the waters of the lake of Zurich.

24
At Antigua and Barbadoes.

At the iſland of Antigua, there was ſuch a ſea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which uſed to be ſix feet deep, was not two inches.—At Barbadoes, about two in the afternoon, the ſea ebbed and flowed in a ſurpriſing manner. It ran over the wharfs and ſtreets into the houſes, and continued thus ebbing and flowing till ten at night.

25
In England

The agitation of the waters was perceived in great numbers of places in Great Britain and Ireland.—Accounts of the moſt remarkable of them follow. At Barlborough in Derbyſhire, between 11 and 12 in the forenoon, in a boat-houſe on the weſt ſide of a large body of water called *Pibley Dam*, ſuppoſed to cover at leaſt 30 acres of land, was heard a ſurpriſing and terrible noiſe; a large ſwell of water came in a current from the ſouth, and roſe two feet on the ſloped dam-head at the north end of the water. It then ſubſided; but returned again immediately, though with leſs violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at laſt it entirely ceaſed.

At Buſbridge in Surrey, at half an hour after ten in the morning, the weather being remarkably ſtill, without the leaſt wind, in a canal near 700 feet long and 58 feet broad, with a ſmall ſpring conſtantly running through it, a very unuſual noiſe was heard at the eaſt end, and the water there obſerved to be in great agitation. It raiſed itſelf in a heap or ridge in the middle; and this heap extended lengthwiſe about 30 yards, riſing between two or three feet above the uſual level. After this, the ridge heeled or vibrated towards the north ſide of the canal with great force, and flowed above eight feet over the graſs walk on that ſide. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the ſouth ſide, and flowed over its graſs walk. During this latter motion, the bottom on the north ſide was left dry for ſeveral feet. This appearance laſted for about a quarter of an hour, after which the water became ſmooth and quiet as before. During the whole time, the ſand at the bottom was thrown up and mixed with the water; and there was a continual noiſe like that of water turning a mill.

At Cobham in Surrey, between 10 and 11 o'clock, a perſon was watering a horſe at a pond fed by ſprings. Whilſt the animal was drinking, the water ſuddenly ran away from him, and moved towards the ſouth with ſuch ſwiftneſs, that the bottom of the pond was left bare. It returned again with ſuch impetuoſity, that the man leaped backwards to ſecure himſelf from its ſudden approach. The ducks were alarmed at the firſt agitation, and inſtantly flew all out of the pond.

At Dunſtall in Suffolk, the water of a pond roſe gradually for ſeveral minutes in the form of a pyramid, and fell down like a water-ſpout. Other ponds in the neighbourhood had a ſmooth flux and reflux from one end to the other.

Near the city of Durham, about half an hour after ten, a gardener was alarmed by a ſudden ruſhing noiſe from a pond, as if the head of the pond had been broken down: when caſting his eye on the water, he ſaw it gradually riſe up, without any fluctuating motion, till it reached a grate which ſtood ſome inches higher than the common water level. After this it ſubſided, and then ſwelled again; thus continuing to riſe and fall during the ſpace of ſix or ſeven minutes, making four or five returns in the ſpace of one minute. The pond was about 40 yards long and 10 broad.

At Earſy Court, Berks, about 11 o'clock, as a gardener was ſtanding by a fiſh pond, he felt a violent trembling of the earth, which laſted about a minute. Immediately after, he obſerved a motion of the water from the ſouth to the north end of the pond, leaving the bottom at the ſouth end altogether dry for about ſix feet. It then returned, and flowed at the ſouth end, riſing three feet up the ſlope bank; and immediately after returned to the north bank, riſing there alſo about three feet. In the time between the flux and reflux, the water ſwelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each ſide, and boiled like a pot. This agitation from ſouth to north laſted about four minutes.

At Eaton-bridge, Kent, in a pond about an acre in ſize, a dead calm, and no wind ſtirring, ſome perſons heard a noiſe, and imagining ſomething had been tumbling in, ran to ſee what was the matter. On their arrival at the pond, to their ſurpriſe they ſaw the water open in the middle, ſo that they could ſee a poſt a good way down, almoſt to the bottom. The water in the mean time daſhed up over a bank two feet high, and perpendicular to the pond. This was repeated ſeveral times with a great noiſe.

At Eyam-bridge, Derbyſhire (in the Peak), the overſeer of the lead-mines ſitting in his writing-room about 11 o'clock, felt a ſudden ſhock, which very ſenſibly raiſed him up in his chair, and cauſed ſeveral pieces of plaſter to drop from the ſides of the room. The roof was ſo violently ſhaken, that he imagined the engine ſhaft had been falling in. Upon this he immediately ran to ſee what was the matter, but found every thing in perfect ſafety.—At this time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raiſed up at the ſhafts. The drift in which they were working was about 120 yards deep, and the ſpace from one end to the other 50 yards or upwards. The miner at the end of the drift had juſt loaded his cart, and was drawing it along; but he was ſuddenly ſurpriſed by a ſhock, which ſo terrified him, that he immediately quitted his employment, and ran to the weſt end of the drift to his partner, who was no leſs terrified than himſelf. They durſt not attempt to climb the ſhaft, leſt that ſhould be running in upon them: but while they were conſulting what means they ſhould take for their ſafety, they were ſurpriſed by a ſecond ſhock more violent than the firſt; which frightened them ſo much, that they both ran precipitately to the other end of the drift. They then went down to another miner who worked about 12 yards below them. He told them that the violence of the ſecond ſhock had been ſo great, that it cauſed the rocks to grind upon one another. His account was interrupted by a third ſhock, which, after an interval of four or five minutes, was ſucceeded by a fourth; and, about the ſame ſpace of time after, by a fifth; none of which were ſo violent as the ſecond. They heard, after every ſhock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreaſing, or ſeeming to remove to a greater diſtance.

At Shireburn caſtle, Oxfordſhire, at a little after ten in the morning, a very ſtrange motion was obſerved in the water of a moat which encompaſſes the houſe. There was a pretty thick fog, not a breath of air, and the ſurface of the water all over the moat as ſmooth as a looking-glaſs, except at one corner, where it flowed into the ſhore, and retired again ſucceſſively, in a ſurpriſing manner. In what manner it began to move is uncertain, as nobody obſerved the beginning of its motion. The flux and reflux, when ſeen, were quite regular. Every flood began gently; its velocity increaſed by degrees, when at laſt it ruſhed in with great impetuoſity, till it had attained its full height. Having remained for a little time ſtationary, it then retired, ebbing gently at firſt, but afterwards ſinking away with great ſwiftneſs. At every flux, the whole body of water ſeemed to be violently thrown againſt the bank; but neither during the time of the flux nor that of the reflux, did there appear even the leaſt wrinkle of a wave on the other parts of the moat. Lord Viſcount Parker, who had obſerved this motion, being deſirous to know whether it was univerſal over the moat, ſent a perſon to the other corner of it, at the ſame time that he himſelf ſtood about 25 yards from him, to examine whether the water moved there or not. He could perceive no motion there, or hardly any: but another, who went to the north-eaſt corner of the moat, diagonally oppoſite to his lordſhip, found it as conſiderable there as where he was. His lordſhip imagining, that in all probability the water at the corner diagonally oppoſite to where he was would ſink as that by him roſe, he ordered the perſon to ſignify by calling out, when the water by him began to ſink, and when to riſe. This he did; but, to his lordſhip's great ſurpriſe, immediately after the water began to riſe at his own end, he heard his voice calling that it began to riſe with him alſo; and in the ſame manner he heard that it was ſinking at his end, ſoon after he perceived it to ſink by himſelf. A pond juſt below was agitated in a ſimilar manner; but the riſings and ſinkings of it happened at different times from thoſe at the pond where lord Parker ſtood.

At White Rock in Glamorganſhire, about two hours ebb of the tide, and near three quarters after ſix in the evening, a vaſt quantity of water ruſhed up with a prodigious noiſe; floated two large veſſels, the leaſt of them above 200 tons; broke their moorings, drove them acroſs the river, and had like to have overſet them. The whole riſe and fall of this extraordinary body of water did not laſt above ten minutes, nor was it felt in any other part of the river, ſo that it ſeemed to have guſhed out of the earth at that place.

26 In Scotland.

At Loch Lomond in Scotland, about half an hour after nine in the morning, all of a ſudden, without the leaſt guſt of wind, the water roſe againſt its banks with great rapidity, but immediately ſubſided, till it was as low in appearance as any body then preſent had ever ſeen it in the greateſt ſummer-drought. Inſtantly it returned towards the ſhore, and in five minutes time roſe again as high as before. The agitation continued at the ſame rate till 15 minutes after ten the ſame morning; taking five minutes to riſe, and as many to ſubſide. From 15 minutes after 10 till 11, the height of every riſe came ſomewhat ſhort of that immediately preceding, taking five minutes to flow, and as many to ebb, till the water was entirely ſettled. The greateſt perpendicular height of this ſwell was two feet four inches. A ſtill more remarkable phenomenon attending the earthquake in this lake was, that a large ſtone lying at ſome diſtance from ſhore, but in ſuch ſhallow water that it could eaſily be ſeen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved.

In Loch Neſs, about half an hour after nine, a very great agitation was obſerved in the water. About ten the river Oich, which runs on the north ſide of Fort Auguſtus, into the head of the loch, was obſerved to ſwell very much, and run upwards from the loch with a pretty high wave, about two or three feet higher than the ordinary ſurface. The motion of the wave was againſt the wind, and it proceeded rapidly for about 200 yards up the river. It then broke on a ſhallow, and flowed three or four feet on the banks, after which it returned gently to the loch. It continued ebbing and flowing in this manner for about an hour, without any ſuch remarkable waves as the firſt; but about 11 o'clock, a wave higher than any of the reſt came up, and broke with ſo much force on the low ground on the north ſide of the river, that it run upon the graſs upwards of 30 feet from the river's bank.

27 In Ireland.

At Kinſale, between two and three in the afternoon, the weather being very calm, and the tide near full, a large body of water ſuddenly poured into the harbour with ſuch rapidity, that it broke the cables of two ſloops, each moored with two anchors, and of ſeveral boats lying between Sicily and the town. But juſt at the time that a great deal of miſchief was apprehended by all the veſſels running foul of each other, an eddy whirled them round ſeveral times, and then hurried them back again with the ſame rapidity as before. This was ſeveral times repeated; and while the current ruſhed up at one ſide of the harbour, it poured down with equal violence at the other. A veſſel that lay all this time in the pool did not ſeem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with moſt violence on the flats. The bottom of the harbour, which is muddy, was much altered; the mud being waſhed from ſome places, and depoſited in others. The perpendicular riſe of the water at one quay was meaſured, and found to be five feet and an half; and is ſaid to have been much higher at another, where it overflowed, and poured into the market-place with ſuch rapidity, that ſome people who were on the quay immediately ran off, and yet could not prevent themſelves from being overtaken and immerſed knee-deep in the water. The agitations extended ſeveral miles up the river; but, as in the harbour, were moſt perceived in the ſhalloweſt places. The ſucceſſive riſings and fallings of the water continued about ten minutes, and then the tide returned to its natural courſe. Between ſix and ſeven in the evening, the water roſe again, though not with ſo great violence as before, and it continued to ebb and flow alternately till three in the morning. The waters did not riſe gradually at firſt; but, with a hollow and horrid noiſe, ruſhed in like a deluge, riſing ſix or ſeven feet in a minute, and as ſuddenly ſubſiding. They were as thick as puddle, very black, and ſtank intolerably.—From different accounts it appeared, that the water was affected in a ſimilar manner all along the coaſt to the weſtward of Kinſale.

28
In France.

In France, ſhocks were perceived in ſeveral places; as at Bayonne, Bourdeaux, and Lyons. Commotions of the waters alſo were obſerved at Angouleſme, Bleville, Havre de Grace, &c. but not attended with the remarkable circumſtances above mentioned.

29
Its effects on ſprings, and on the earth itſelf.

Theſe are the moſt ſtriking phenomena with which the earthquake of Nov. 1. 1755 was attended on the ſurface of the earth. Thoſe which happened below ground cannot be known but by the changes obſerved in ſprings, &c. which were in many places very remarkable.—At Colares, on the afternoon of the 31ſt of October, the water of a fountain was greatly decreaſed: on the morning of the firſt of November it ran very muddy; and, after the earthquake, returned to its uſual ſtate both as to quantity and clearneſs. On the hills, numbers of rocks were ſplit; and there were ſeveral rents in the ground, but none conſiderable. In ſome places where formerly there had been no water, ſprings burſt forth, which continued to run.—Some of the largeſt mountains in Portugal were impetuouſly ſhaken as it were from their foundation; moſt of them opened at their ſummits, ſplit and rent in a wonderful manner, and huge maſſes of them were thrown down into the ſubjacent valleys.—From the rock called *Pedra de Alvidar*, near the hill Fojo, a kind of parapet was broken off, which was thrown up from its foundation in the ſea.—At Varge, on the river Macaas, at the time of the earthquake, many ſprings of water burſt forth, ſome ſpouted to the height of 18 or 20 feet, throwing up ſand of various colours, which remained on the ground. A mountainous point, ſeven or eight leagues from St Ube's, cleft aſunder, and threw off ſeveral vaſt maſſes of rock.—In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. In another place, a mountain burſt open, and a ſtream iſſued from it as red as blood. At Tangier, all the fountains were dried up, ſo that there was no water to be had till night.—A very remarkable change was obſerved on the medicinal waters of Toplitz, a village in Bohemia famous for its baths. Theſe waters were diſcovered in the year 762; from which time the principal ſpring of them had conſtantly thrown out hot water in the ſame quantity, and of the ſame quality. On the morning of the earthquake, between 11 and 12 in the forenoon, the principal ſpring caſt forth ſuch a quantity of water, that in the ſpace of half an hour all the baths ran over. About half an hour before this great increaſe of the water, the ſpring flowed turbid and muddy; then having ſtopped entirely for a minute, it broke forth again with prodigious violence, driving before it a conſiderable quantity of reddiſh ochre. After this it became clear, and flowed as pure as before. It ſtill continues to do ſo; but the water is in greater quantity, and hotter, than before the earthquake. At Angouleſme in France, a ſubterraneous noiſe like thunder was heard; and preſently after the earth opened, and diſcharged a torrent of water mixed with red ſand. Moſt of the ſprings in the neighbourhood ſunk in ſuch a manner, that for ſome time they were thought to be quite dry. In Britain, no conſiderable alteration was obſerved in the earth, except that, near the lead mine above mentioned in Derbyſhire, a cleft was obſerved about a foot deep, ſix inches wide, and 150 yards in length.

30
Effects of the earthquake at ſea.

At ſea, the ſhocks of this earthquake were felt moſt violently. Off St Lucar, the captain of the Nancy frigate felt his ſhip ſo violently ſhaken, that he thought ſhe had ſtruck the ground; but, on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. Lat. 36. 24. between nine and ten in the morning, had his ſhip ſhaken and ſtrained as if ſhe had ſtruck upon a rock, ſo that the ſeams of the deck opened, and the compaſs was overturned in the binnacle. The maſter of a veſſel bound to the American iſlands, being in N. Lat. 25°, W. Long. 40°, and writing in his cabin, heard a violent noiſe, as he imagined, in the ſteerage; and while he was aſking what the matter was, the ſhip was put into a ſtrange agitation, and ſeemed as if ſhe had been ſuddenly jerked up and ſuſpended by a rope faſtened to the maſt-head. He immediately ſtarted up with great terror and aſtoniſhment; and looking out at the cabin-window, ſaw land, as he took it to be, at the diſtance of about a mile. But, coming upon the deck, the land was no more to be ſeen, but he perceived a violent current croſs the ſhip's way to the leeward. In about a minute, this current returned with great impetuoſity, and at a league's diſtance he ſaw three craggy-pointed rocks throwing up water of various colours reſembling fire. This phenomenon, in about two minutes, ended in a black cloud, which aſcended very heavily. After it had riſen above the horizon, no rocks were to be ſeen; though the cloud, ſtill aſcending, was long viſible, the weather being extremely clear.—Between nine and ten in the morning, another ſhip, 40 leagues weſt of St Vincent, was ſo ſtrongly agitated, that the anchors, which were laſhed, bounced up, and the men were thrown a foot and an half perpendicularly up from the deck. Immediately after this, the ſhip ſunk in the water as low as the main chains. The lead ſhowed a great depth of water, and the line was tinged of a yellow colour and ſmelt of ſulphur. The ſhock laſted about ten minutes, but they felt ſmaller ones for the ſpace of 24 hours.

31
Of the earthquakes in Calabria in 1783.

32
Sir William Hamilton's account of their extent.

Such were the phenomena of this very remarkable and deſtructive earthquake, which extended over a tract of at leaſt four millions of ſquare miles. The earthquakes, however, which in the year 1783 ruined a great part of Italy and Sicily, tho' much more confined in their extent, ſeem to have been not at all inferior in violence. Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compaſs on the ſcale of Italian miles you were to meaſure off 22, and then, fixing the central point in the city of Oppido (which ſeemed to be the ſpot where the earthquake had exerted its greateſt force) form a circle (the radii of which will be 22 miles), you will then include all the towns, villages, &c. that have been utterly ruined, and the ſpots where the greateſt mortality happened, and where there have been the moſt viſible alterations on the face of the earth: then extend your compaſs on the ſame ſcale to 72 miles, preſerving the ſame centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly obſerved in the damage done to the buildings, as alſo in the degree of mortality, in proportion as the countries were more or leſs diſtant from this ſuppoſed centre of the evil." Another circumſtance was particularly remarked, and in which this earthquake differed very conſiderably from others, viz. that if two towns were ſituated at an equal diſtance from this centre, one on the hill, the other on the plain or in a bottom, the latter always ſuffered more by the ſhocks of the earthquakes than the former.

33
General account of their effects.

From the moſt authentic reports and accounts received by his Sicilian majeſty's ſecretary of ſtate, it was learned, that the part of Calabria which had been moſt affected by this heavy calamity, is that comprehended between the 38th and 39th degree of latitude: that the greateſt force of the earthquake ſeemed to have exerted itſelf from the foot of thoſe mountains of the Apennines called the Monte Dijo, Monte Sacro, and Monte Caulene, extending weſtward to the Tyrrhene ſea: that the towns, villages, and farm-houſes neareſt theſe mountains, ſituated either on the hills or the plain, were totally ruined by the ſhock of the 5th of February about noon: that as the towns and villages were at a greater diſtance from this centre, the damage they received was leſs conſiderable; but that even theſe more diſtant towns had been greatly damaged by the ſubſequent ſhocks of the earthquakes, and effectually by thoſe of the 7th, 26th, and 28th of February, and that of the 1ſt of March; that from the firſt ſhock of the 5th of February, the earth had been in a continual tremor; and that the ſhocks were more ſenſibly felt at times in ſome parts of the afflicted provinces than at others; that the motion of the earth had been either whirling like a vortex, horizontal, or by pulſations, or by beatings from the bottom upwards. This variety of motions increaſed the apprehenſions of the miſerable inhabitants, who expected every moment that the earth would open under their feet, and ſwallow them up. It was ſaid alſo that the rains had been continued and violent, frequently accompanied with irregular and furious guſts of wind; and that from all theſe cauſes, the face of that part of Calabria comprehended between the 38th and 39th degrees was entirely altered, particularly on the weſtern ſide of the mountains above mentioned: that many openings and cracks had been made in thoſe parts; ſome hills had been much lowered, and others entirely ſwallowed up; deep chaſms had been made, by which many roads were rendered impaſſable; huge mountains were ſaid to have been ſplit aſunder, and the parts of them driven to a conſiderable diſtance; deep valleys to have been filled up by the concourſe of the mountains which formed them before; the courſe of rivers altered; many ſprings of water dried up, and new ones formed in their place, &c. A ſingular phenomenon was ſaid to have been obſerved at Laureana in Calabria Ultra; viz. that two whole tenements, with large plantations of olive and mulberry trees, ſituated in a valley perfectly level, had been detached by the earthquake, and tranſplanted, with the trees ſtill remaining in their places, to the diſtance of about a mile from their firſt ſituations; and that from the ſpot on which they formerly ſtood, hot water had ſprung up to a conſiderable height, mixed with ſand of a ferruginous nature: that near this place alſo ſome countrymen and ſhepherds had been ſwallowed up, with their teams of oxen, and their flocks of goats and ſheep. The number of lives loſt was eſtimated at 32,367; but Sir William Hamilton is of opinion, that, including ſtrangers, it could not be leſs than 40,000.

34
Fate of the inhabitants of Scilla.

35
A hill removes from its place.

The fate of the inhabitants of Scilla was extremely affecting. On the firſt ſhock of the earthquake February 5th, they had fled along with their prince to the ſea-ſhore, where they hoped for ſafety; but in the night-time a furious wave (ſaid to have been boiling hot, and by which many people were alleged to have been ſcalded) overflowed the land for three miles, ſweeping off in its return 2473 of the inhabitants, among whom was the prince himſelf, who were at that time either on the ſtrand or in boats near the ſhore. But the moſt ſingular of all the phenomena enumerated in theſe accounts was, that a hill, about 500 palms in height, and 1300 in circumference at its baſis, jumped to the diſtance of about four miles from the place where it formerly ſtood. At the ſame time the hill on which the town of Oppido ſtood, which extended about three miles, parted in two; and as its ſituation was between two rivers, both of theſe were of courſe ſtopped up; two great lakes were formed, and by their continual increaſe threatened to infect the air by their noxious exhalations.

36
Authenticity of theſe accounts examined by Sir William Hamilton.

Such were the accounts at firſt propagated and univerſally believed; but Sir William Hamilton, who made a tour through the ruined country that ſame year, found that, though the effects in general were very dreadful, ſtill there had been ſome exaggeration in ſeveral particulars. He ſet ſail, for the purpoſe of making this tour, on the 2d of May, for Naples, and ſoon landed on the coaſt of Calabria Citra. The firſt appearances of the earthquake were obſerved at Cedraro; ſome of the principal inhabitants of that city having quitted their habitations, though Sir William could not perceive that any damage had been done. At St Lucido, the baron's palace and the church ſteeple had ſuffered, and moſt of the inhabitants were in barracks; but wiſhing to come as ſoon as poſſible to the centre of that ſcene of deſolation, he ſet ſail again, and landed on the 6th of May at the town of Pizzo in Calabria Ultra. This town is ſituated on a volcanic tufa, and had been greatly damaged by the earthquake of February 5th, but completely ruined by that of the 28th of March.

37 Leſs ſmoke than uſual emitted by Stromboli during the earthquakes.

Here he was aſſured, that the volcano of Stromboli, which is oppoſite, and in full view of the town, though diſtant about 50 miles, had ſmoked leſs and thrown up a ſmaller quantity of inflamed matter during the earthquakes than it had done for ſome years before; and that ſlight ſhocks ſtill continued to be felt. Sir William had ſoon a convincing proof that this laſt information was true; for, ſleeping that night in his boat, (called a *Malteſe Speronara*), he was awakened with a ſmart ſhock, which ſeemed to lift up the bottom of the boat, but was not attended with any ſubterraneous noiſe.

From Pizzo he paſſed through a moſt beautiful country to Monteleone. This town, anciently called *Vibo Valentia*, is finely ſituated on a hill, overlooking the ſea and the fine rich plains through which he had juſt paſſed; which are bounded by the Apennines, and crowned by Aſpramonte the higheſt of them all. They were formerly interſperſed with towns and villages; but at that time all of them lay in ruins. Monteleone ſuffered little on the 5th of February, but was greatly damaged on the 28th of March.

38 Manner in which the ſhocks came at Monteleone.

Here every one agreed, that the ſhocks of the earthquake ſeemed to come with a rumbling noiſe from the weſtward; beginning uſually with the horizontal motion, and ending with the vorticoſe, by which laſt the greateſt part of the buildings in this province were deſtroyed. It was a general obſervation alſo, that before a ſhock the clouds ſeemed to be ſtill and motionleſs, and that immediately after a heavy ſhower of rain a ſhock quickly followed. Here Sir William had an opportunity of ſeeing many people who had been thrown down by the violence of the ſhocks.

39 Their exceſſive violence.

Several peaſants told him, that the motion of the earth was ſo violent, that the heads of the largeſt trees almoſt touched the ground from ſide to ſide; that during a ſhock, the horſes and oxen extended their legs wide aſunder, that they might not be thrown down; and that they gave evident ſigns of being ſenſible of the approach of each ſhock. "I myſelf (ſays he) have obſerved, that in thoſe parts which have ſuffered moſt by earthquakes, the braying of an aſs, the neighing of a horſe, or the cackling of a gooſe, always drove people out of their barracks, and was the occaſion of many Pater-noſters and Ave-marias being repeated, in expectation of a ſhock."

From Monteleone our author deſcended into the plain, having paſſed through many towns and villages which had been more or leſs ruined according to their vicinity to the plain. The town of Mileto, ſtanding in a bottom, was totally ruined, not a houſe being left ſtanding. At ſome diſtance he ſaw Soriano, and the noble Dominican convent, a heap of ruins.

40 Leſs violent on the high grounds than on the plain.

In this day's journey, he obſerves, that all habitations ſituated upon high grounds, the ſoil of which is a gritty ſandſtone, ſomewhat like a granite, but without the conſiſtence, had ſuffered leſs than thoſe ſituated on the plain; the latter being univerſally levelled with the ground. The ſoil of the plain is a ſandy clay, white, red, and brown; but the white prevails moſt, and is full of marine ſhells, particularly ſcollops. It is interſected in many parts by rivers and torrents, which have produced wide and deep ravines all over the country. Paſſing through the ruined town of St Pietro, in his way to Roſarno, our author had a diſtant view of Sicily and the ſummit of Mount Etna, which then ſent forth a conſiderable ſmoke. Juſt before his arrival at Roſarno, he paſſed over a ſwampy plain, in many parts of which he was ſhown ſmall hollows in the earth, of the ſhape of an inverted cone. They were covered with ſand, as was the ſoil near them.

41 Conical openings made in the earth, which ſpouted up water during the ſhock.

He was informed, that during the earthquake of the 5th of February, a fountain of water, mixed with ſand, had been driven up from each of theſe ſpots to a conſiderable height. Here he ſpoke to a peaſant who had been an eye-witneſs, and was even covered with the water and ſand; but he aſſured him, that it was not hot, as had been repreſented.

42 Rivers dried up for a ſhort time.

Before this appearance, he ſaid, the river was dry; but ſoon after returned and overflowed its banks. He afterwards found, that the ſame phenomenon had been conſtant with reſpect to all other rivers in the plain, during the dreadful ſhock of the 5th of February.

43 This phenomenon accounted for.

This phenomenon, our author thinks, may be eaſily explained by ſuppoſing the firſt impulſe of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain atteſted to be fact; the ſurface of the plain ſuddenly riſing, the rivers, which are not deep, would naturally diſappear, and the plain returning with violence to its former level, the rivers muſt naturally have returned and overflowed, as the ſudden depreſſion of the boggy grounds would as naturally force out the water that lay hid under their ſurface. It was obſerved in the other parts where this phenomenon had been exhibited, that the ground was always low and ruſhy.

44 Appearance of a bridge on the Metauro.

Between this place and Roſarno they paſſed the river Meſſano or Metauro (which is near the town above mentioned) on a ſtrong timber-bridge, 700 palms long, lately built by the duke of Monteleone. From the cracks made in the banks and in the bed of the river by the earthquake, it was quite ſeparated in one part; and the level on which the piers were placed having been variouſly altered, the bridge had taken an undulated form, ſo that the rail on each ſide was curiouſly ſcolloped; but the ſeparated parts having been joined again, it was then paſſable. Our author was alſo informed, that at the time of the earthquake the river was perfectly dry for ſome ſeconds, and then returned with violence and overflowed; and that the bridge undulated in a moſt extraordinary manner. By the earthquake in the plain, our author underſtands the ſhock of the 5th of February, which did ſo much damage without giving any previous notice.

The town of Roſarno, with the duke of Monteleone's palace there, was entirely ruined; but the walls remained about ſix feet high, and were at that time fitting up as barracks. The only building that remained unhurt at Roſarno was the town gaol, in which were three notorious villains, who would probably have loſt their lives if they had remained at liberty.

45
Explanation of the change of place of two tenements of land.

From Roſarno Sir William proceeded to Laureana, where he was conducted to the place where two tenements were ſaid to have exchanged ſituations. This fact, which at the firſt relation appeared ſo incredible, Sir William aſſures us was true, and very eaſily accounted for. Theſe tenements were ſituated in a valley ſurrounded by high grounds; and the ſurface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly diſcernible on the bare ſpot which the tenements had quitted. Their courſe down the valley was ſufficiently rapid to prove that it had not been a perfect level as was repreſented. The earthquake, he ſuppoſes, had opened ſome depoſitories of rain-water in the clay-hills which ſurround the valley; which water, mixed with the looſe ſoil, taking its courſe ſuddenly through the undermined ſurface, lifting it up with the large olive and mulberry trees, and a thatched cottage, floated the whole piece of ground, with all its vegetation, about a mile down the valley, where it then ſtood with moſt of the trees erect. Theſe two tenements were about a mile long and half a mile broad. In the neighbourhood were ſeveral cracks, none of them above a foot wide; but our author was aſſured, that during the earthquake they had opened wide, and ſwallowed up an ox with near 100 goats. In the above mentioned valley he ſaw the ſame ſort of hollows in the form of inverted cones, out of which he had been aſſured that hot water mixed with ſand iſſued during the earthquakes as at Roſarno; but, on proper inquiry, no perſon was found who could poſitively declare that the water had really been hot. Some of the ſand which was thrown up had a ferruginous appearance, and ſeemed to have been acted upon by fire. It was ſaid alſo, that, when freſh, this ſand had the ſmell of ſulphur; but this our author could not perceive.

46
Cracks in the earth opened wide during the earthquake, and afterwards cloſed.

47
No hot water thrown up by the earth.

48
All the inhabitants of ſeveral towns buried in an inſtant in the ruins of their houſes.

Paſſing through the ſame beautiful country to the town of Poliſtene, he did not perceive a ſingle houſe ſtanding. "I travelled (ſays he) four days in the plain, in the midſt of ſuch miſery as cannot be deſcribed. The force of the earthquake there was ſo great, that all the inhabitants of the towns were buried, alive or dead, in the ruins of their houſes in an inſtant. The town of Poliſtene was large, but ill ſituated between two rivers that were ſubject to overflow. Two thouſand one hundred, out of 6000, loſt their lives here on the fatal 5th of February." At Caſal Nuova, the princeſs Gerace Grimaldi, with 4000 of her ſubjects, periſhed on the ſame day by the exploſion; for ſuch it appears to have been. Some who had been dug alive out of the ruins, told our author, that they had felt their houſes fairly lifted up, without having the leaſt previous notice. An inhabitant of Caſal Nuova was at that moment on a hill overlooking the plain; when, feeling the ſhock, and turning round, inſtead of the town he ſaw only a thick cloud of white duſt like ſmoke, the natural effect of the cruſhing of the buildings and the mortar flying off.

49
Houſes of Caſal Nuova lifted at once from their foundation.

The town of Caſal Nuova was ſo effectually deſtroyed by this dreadful ſhock, that neither veſtige of houſe or ſtreet remained, but all lay in one confuſed heap of ruins. Caſtillace and Milicuſco, which our author next viſited, were both in the ſame ſituation. Terra Nuova, ſituated in the ſame plain, ſtood between two rivers, which, with the torrents from the mountains, had, in the courſe of ages, cut deep and wide chaſms in the ſoft ſandy clay ſoil of which it is compoſed. At Terra Nuova the ravine or chaſm is not leſs than 500 feet deep, and three quarters of a mile broad. Here the accounts of the earthquake were confuſed, by not having the ſituation of the place and nature of the ſoil explained. It was ſaid, that a town had been thrown a mile from the place on which it ſtood, without mentioning a word of the ravine; that woods and corn-fields had been removed in the ſame manner, "when in truth (ſays our author) it was but upon a large ſcale, what we ſee every day upon a ſmaller; when pieces of the ſides of hollow ways, having been undermined by rain waters, are detached by their own weight. Here, from the great depth of the ravine, and the violent motion of the earth, two huge portions of the latter, on which a great part of the town ſtood, which conſiſted of ſome hundred houſes, had been detached into the ravine, and nearly acroſs it, at about the diſtance of half a mile from the place where they formerly ſtood; and what is very extraordinary, many of the inhabitants who had taken this ſingular leap in their houſes, were nevertheleſs dug out alive, and ſome unhurt." Our author's guide there, who was both a prieſt and phyſician, having been buried in the ruins of his houſe by the firſt ſhock, was blown out of it and delivered by the ſecond, which immediately followed the firſt; and there were many well atteſted inſtances of the ſame thing having happened in different parts of Calabria. At Terra Nuova, however, only 400 out of 1600 inhabitants were left alive.

50
Removal of part of the town of Terra Nuova explained.

51
Extraordinary eſcape of ſome of the inhabitants.

52
Great tracts of land moved from their places.

In other parts of the plain, ſituated near the ravine, and near the town of Terra Nuova, our author ſaw many acres of land, with trees and corn-fields, that had been detached into the ravine, frequently without having been overturned; ſo that the crops were growing as well as if they had been planted there. Other ſuch pieces were lying in the bottom in an inclined ſituation; and others again that had been quite overturned. In one place, two of theſe immenſe pieces of land having been detached, oppoſite to one another, had filled the valley, and ſtopped the courſe of the river, the waters of which were forming a great lake; "and this (ſays our author) is the true ſtate of what the accounts mention of mountains that had walked, and joined together, ſtopped the courſe of a river, and formed a lake."

At the moment of the earthquake the river diſappeared as at Roſarno; and returning ſoon after, overflowed the bottom of the ravine about three feet in depth; ſo that the poor people who had been thrown with their houſes into the ravine from the top of it, and had eſcaped with broken bones, were now in danger of being drowned. Our author was aſſured, that the water was ſalt like that of the ſea; but this circumſtance ſeemed to want confirmation. The ſame cauſe, however, given for the ſudden diſappearing of the river Metauro at Roſarno will account for the like phenomenon here, and in every part of the country where the rivers were dried up at the moment of the earthquake.

53 Water-mills raiſed up to an elevated ſituation.

The whole town of Mollochi di Sotto was likewiſe detached into the ravine, and a vineyard of many acres lay near it in the bottom in perfect order, but in an inclined ſituation. There was a foot-path through this vineyard which had a ſingular effect in its then impracticable ſituation. Some water-mills which were on the river, being jammed between two ſuch detached pieces as above deſcribed, were lifted up by them, and were then to be ſeen on an elevated ſituation many feet above the level of the river.

54 Riſing of the ground in ſome places, and ſinking in others, explained.

55 Cracks in the earth, why generally formed near ravines.

In ſeveral parts of the plain, the ſoil, with timber-trees and crops of corn, conſiſting of many acres, had ſunk eight and ten feet below the level of the plain, and riſen as many in other places. To explain this, it is neceſſary to remember, that the ſoil of the plain is a clay mixed with ſand, which is eaſily moulded into any ſhape. In the plain, near the ſpots where the above mentioned pieces had been detached into the ravine, there were ſeveral parallel cracks; ſo that, had the violence of the earthquake continued, theſe pieces would alſo probably have followed. It was conſtantly remarked by our author, that near every ravine or hollow way, the parts of the plain adjoining were full of large parallel cracks. The earth rocking from ſide to ſide, and being ſupported only on one ſide, accounts very well for this circumſtance.

56 Splitting of the mountain at Oppido explained.

57 A countryman detached with a great tract of land acroſs a ravine.

From Terra Nuova our author continued his journey to Oppido. This city ſtands on a mountain of a ferruginous ſort of gritty ſtone, unlike the clay ſoil of its neighbourhood; and is ſurrounded by two rivers in a ravine deeper and broader than that at Terra Nuova. Inſtead of the mountain on which this city ſtands having ſplit, as was reported, and by its fall ſtopped up the courſe of rivers, it was, as at Terra Nuova, huge pieces of the plain on the edge of the ravine, that had been detached into it, had nearly filled it up, and ſtopped the courſe of the rivers, the waters of which were then forming two great lakes. Part of the rock on which the city ſtood was indeed alſo detached, with ſeveral houſes, into the ravine: "But that (ſays our author) is a trifling circumſtance in compariſon of the very great tracts of land with plantations of vines and olives which had been detached from one ſide of the ravine to the other, though the diſtance is more than half a mile. It is well atteſted, that a countryman, who was ploughing his field in this neighbourhood with a pair of oxen, was tranſported with his field and team clear, from one ſide of a ravine to the other, and that neither he nor his oxen were hurt.

58 Mountains and lakes formed by the earthquakes.

59 Obſervations on the ſoil of the detached tracts of land, and the effects of the ſhock upon them.

"Having walked over the ruins of Oppido (ſays our author), I deſcended into the ravine, and examined carefully the whole of it. Here I ſaw indeed the wonderful force of the earthquake, which has produced exactly the ſame effects as thoſe deſcribed in the ravine at Terra Nuova, but on a ſcale infinitely greater. The enormous maſſes of the plain, detached from each ſide of the ravine, lie ſometimes in confuſed heaps, forming real mountains, and having ſtopped the courſe of two rivers (one of which is very conſiderable), great lakes are already formed; and if not aſſiſted by nature or art, ſo as to give the rivers their due courſe, muſt infallibly be the cauſe of a general infection in the neighbourhood. Sometimes I met with a detached piece of the ſurface of the plain (of many acres in extent) with the large oaks and olive-trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine as their companions from whence they were ſeparated do on their native ſoil, at leaſt 500 feet higher, and at the diſtance of about three quarters of a mile. I met with whole vineyards in the ſame order in the bottom that had likewiſe taken the ſame journey. As the banks of the ravine from whence theſe pieces came are now bare and perpendicular, I perceived that the upper ſoil was a reddiſh earth, and the under one a ſandy white clay, very compact, and like a ſoft ſtone. The impulſe theſe huge maſſes received, either from the violent motion of the earth alone, or that aſſiſted with the additional one of the volcanic exhalations ſet at liberty, ſeems to have acted with greater force on the lower and more compact ſtratum than on the upper cultivated cruſt: for I conſtantly obſerved, where theſe cultivated lands lay, the under ſtratum of compact clay had been driven ſome hundred yards farther, and lay in confuſed blocks; and, as I obſerved, many of theſe blocks were in a cubical form. The under ſoil, having had a greater impulſe, and leaving the upper in its flight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at preſent in the bottom of the ravine.

60 Removal of the hill accounted for.

61 Some parts of the ſoil run like a volcanic lava.

"In another part of the bottom of the ravine there is a mountain compoſed of the ſame clay ſoil, and which was probably a piece of the plain detached by an earthquake at ſome former period: it is about 250 feet high, and 400 feet diameter at its baſis. This mountain, as is well atteſted, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the freſh detached pieces of the plain which I ſaw heaped up at the back of it, the nature of the ſoil of which it is compoſed, and particularly its ſituation on a declivity, accounts well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found ſome ſingle timber-trees alſo with a lump of their native ſoil at their roots, ſtanding upright in the bottom of the ravine, and which had been detached from the bottom of the plain above mentioned. I obſerved alſo, that many confuſed heaps of the looſe ſoil, detached by the earthquake from the plains on each ſide of the ravine, had actually run like a volcanic lava (having probably been aſſiſted by the heavy rain), and produced many effects much reſembling thoſe of lava during their courſe down a great part of the ravine. At Santa Criſtina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February ſeems to have been exerted on theſe parts, and at Caſal Nuova, and Terra Nuova."

From Oppido Sir William proceeded to the towns of Seminara and Palmi. The former, being ſituated

62 Singular circumſtance of a rivulet of oil by the breaking of the veſſels in Palmi.

63 A ſhock with an exploſion felt by Sir William Hamilton.

64 Fire iſſuing from the earth ſuppoſed to be electric.

higher up, had ſuffered leſs than Palmi which ſtood nearer the ſea. Fourteen hundred lives were loſt at this place, and ſome ſingular circumſtances occurred. The town being a great market for oil, there were upwards of 4000 barrels of that liquid in it at the time of its deſtruction; ſo that by the breaking of theſe barrels and jars, a rivulet of oil ran from the ruins for many hours into the ſea. Here our author was informed by the perſon who conducted him, that he had been buried in the ruins of his houſe by the firſt ſhock; and that after the ſecond, which followed immediately, he found himſelf ſitting aſtride a beam at leaſt 15 feet high in the air. After Sir William's departure from Palmi, in going through one of the narrow paſſes among the mountains of Bagnara and Solano, he felt a very ſmart ſhock of an earthquake attended with a loud exploſion like that of ſpringing a mine; but fortunately it did not detach any rocks or trees from the high mountains which hung over their heads. In this country he was aſſured by ſeveral fiſhermen, that during the earthquake on the 5th of February, at night, the ſea was hot, and that they ſaw fire iſſue from the earth in many parts. This laſt circumſtance was frequently repeated in different parts of the plain, ſo that there ſeems to remain no doubt of its authenticity. The idea of Sir William Hamilton is, that "the exhalations which iſſued during the violent commotions of the earth were full of electrical fire; juſt as the ſmoke of volanoes conſtantly is during violent eruptions: for I ſaw no mark (ſays he), in any part of my journey, of any volcanic matter having iſſued from the fiſſures of the earth; and I am convinced that the whole has been done by vapours and exhalations only. The firſt ſhock felt at this place, as I was aſſured, was lateral, and then vorticoſe, and exceedingly violent; but what they call violent here muſt have been nothing in compariſon of what was felt in the plain of Caſa Nuova, Poliſtene, Palmi, Terra Nuova, Oppido, &c. &c. where all agreed that the violence of the fatal ſhock of February was inſtantaneous, without warning, and from the bottom upwards."

65 Brute animals ſenſible of the approach of earthquakes.

At Reggio the ſhock had been much leſs violent than in the places hitherto viſited by our author; and "though there was not a houſe in it inhabited or habitable, yet (ſays he) after having been ſeveral days in the plain, where every building is levelled with the ground, a houſe with a roof, or a church with a ſteeple, was to me a new and refreſhing object." In this place he had an account from the archbiſhop of the earthquakes of 1770 and 1780, which obliged the inhabitants, in number 16,400, to encamp or remain in barracks for ſeveral months, without having done any conſiderable damage to the town. He was informed alſo, that all animals and birds are in a greater or leſſer degree much more ſenſible of an approaching ſhock of an earthquake than any human being; but that geeſe, above all, ſeem to be the ſooneſt and moſt alarmed at the approach of a ſhock: if in the water, they quit it immediately; and there are no means of driving them into it for ſome time after. The ſhock which damaged Reggio came on gently, ſo that the people had time to make their eſcape, and only 126 were killed; but in the plain this ſhock was as inſtantaneous as it was violent and deſtructive.

66 Earthquake leſs violent at Meſſina than in Italy.

On the 14th of May, Sir William Hamilton having taken leave of Reggio, ſet ſail for Meſſina, which he viſited next morning; and found that the ſhock, tho' very violent there, had been far inferior to what he had ſeen the effects of in other places. Many houſes, even in the lower part of the town, were ſtanding, and ſome little damaged; but in the upper and more elevated ſituations, the earthquakes ſeemed to have ſcarce had any effect. "A ſtrong inſtance (ſays our author) of this is, that the convent of Santa Barbara, and that called the *Novitiato de Geſniti*, both on an elevated ſituation, have not a crack in them; and that the clock of the latter has not been deranged in the leaſt by the earthquakes, which have afflicted this country for four months paſt, and which ſtill continue in ſome degree."

67 Effects of it there.

68 Remarkable circumſtance reſpecting a kind of ſmall fiſhes.

69 Extraordinary boiling of the ſea near Meſſina.

Notwithſtanding this comparative mildneſs, however, the ſhock at Meſſina had been very terrible. All the beautiful front of the palazzate, which extended in very lofty uniform buildings, in the ſhape of a creſcent, had been in ſome parts totally ruined, in others leſs; and there were cracks in the earth of the quay, a part of which had ſunk above a foot below the level of the ſea. Theſe cracks were probably occaſioned by the horizontal motion of the earth in the ſame manner as the pieces of the plain were detached into the ravines at Oppido and Terra Nuova; for the ſea at the edge of the quay is ſo very deep, that the largeſt ſhips can lie along ſide. The earth, therefore, in its violent commotion, wanting ſupport on that ſide next the ſea, began to crack and ſeparate; and as where there is one crack there are generally others leſs conſiderable in lines parallel to the firſt, our author ſuppoſes, that the great damage done to the houſes neareſt the quay was owing to ſuch cracks below their foundations. It is ſaid, that during the earthquake fire had been ſeen to iſſue from the cracks of the quay; but our author is perſuaded that this, as in other caſes, was only a vapour charged with electrical fire or a kind of inflammable air. Here alſo he was informed, that the ſhock of the 5th of February had been from the bottom upwards; but the ſubſequent ones generally horizontal or vorticoſe. A remarkable circumſtance was obſerved at Meſſina, and through the whole coaſt of Calabria, which had been moſt affected by the earthquake, *viz.* that a ſmall fiſh called *cicirelli*, reſembling the Engliſh white bait, but larger, and which uſually lie at the bottom of the ſea buried in the ſand, had, ever after the commencement of the earthquakes to the time this account was written, continued to be taken near the ſurface, and that in ſuch abundance as to be common food for the pooreſt ſort of people; whereas before the earthquakes this fiſh was rare, and reckoned among the greateſt delicacies. Fiſh of all kinds alſo were taken in greater abundance on theſe coaſts after the commencement of the earthquakes than before; which our author ſuppoſes to have been occaſioned either by the volcanic matter having heated the bottom of the ſea, or that the continual tremor of the earth had forced them out of their retreats. At Meſſina our author was likewiſe informed, that on the 5th of February, and for three days following, the ſea about a quarter of a mile from the citadel roſe and boiled in an extraordinary manner, and with a moſt horrid and alarming noiſe; the water in other parts of the ſtrait being perfectly calm. "This (ſays our author) ſeems to point out exhalations or eruptions from cracks at the bottom of the ſea, which may very probably have happened during the violence of the earthquakes; all of which I am convinced have here a volcanic origin."

70
Account of the great wave which deſtroyed the inhabitants of Scilla.

The next inquiry made by this curious traveller was concerning the great wave which occaſioned ſuch deſtruction at Scilla, as has already been related. Having left Meſſina on the 17th of May, he proceeded in his boat to the entrance of the Faro, where he met with a prieſt who had been there on the night between the 5th and 6th of February, when the wave paſſed over that point of land. Here it carried off boats with 24 people, tore up trees by the roots, and left a conſiderable quantity of fiſh behind it. This prieſt had himſelf been covered by the wave, and with difficulty ſaved his life. He at firſt ſaid the water was hot; but on being preſſed with other queſtions, it amounted to no more than that the water was as warm as it uſually is in ſummer. The wave, he ſaid, roſe to a great height, and came on with noiſe and ſuch rapidity that it was impoſſible to eſcape.

71
The water was not hot as had been reported.

On croſſing over to Scilla, Sir William was perfectly ſatisfied concerning the nature of this formidable wave, and found that the following was the true ſtate of the fact: "The prince of Scilla having remarked, that during the firſt horrid ſhock, which happened about noon the 5th of February, part of a rock near Scilla had been detached into the ſea; and fearing that the rock of Scilla, on which his town and caſtle are ſituated, might alſo be detached, he thought it ſafer to prepare boats, and retire to a little port or beach ſeated at the foot of it, and likewiſe ſurrounded by rocks. But the ſecond ſhock of the earthquake about midnight, having detached a whole mountain much higher than that of Scilla, ſituated between the latter and Torre del Cavallo, it fell into the ſea with ſuch violence as to raiſe the fatal wave above mentioned. This having broken on the point of land called *Punto del Faro*, in the manner already related, inſtantly returned with great noiſe and celerity upon the beach, where the unfortunate prince and his ſubjects had taken refuge, and either daſhed them with their boats and effects againſt the rocks, or whirled them into the ſea. Thoſe who had eſcaped the firſt and greateſt wave, were carried off by a ſecond and third leſs conſiderable, but which immediately followed the firſt. Our author ſpoke with many who had been involved in that wave, and violently hurt by it; but all of them agreed in aſſerting that the water was not hot.

72
This wave raiſed by a mountain falling into the ſea.

73
Conjecture concerning a volcanic exploſion in the bottom of the ſea.

The earthquakes were not perfectly ſettled even in 1784, when Sir William Hamilton wrote the account of the ſtate of Veſuvius, &c. to the Royal Society. In a poſtſcript to that letter he adds the following confirmation of his conjecture, that the volcanic matter, which he ſuppoſed to have occaſioned the earthquakes, had vented itſelf at the bottom of the ſea betwixt Calabria and Sicily. "The pilot of one of his Sicilian majeſty's ſciabecques having ſome time after the earthquakes caſt anchor off the point of Palizzi, where he had often anchored in 25 fathom water, found no bottom till he came to 65; and having ſounded for two miles out at ſea towards the point of Spartivento in Calabria, he ſtill found the ſame conſiderable alteration in the depth. The inhabitants of Palizzi likewiſe declare, that during the great earthquake on the 5th of February 1783, the ſea had boiled and frothed up tremendouſly off their point."

74
Hypotheſes concerning the cauſe of earthquakes.

To explain the phenomena of earthquakes, various hypotheſes have been invented. Till lately, the hypotheſes of modern philoſophers were much the ſame with thoſe of the ancients. Anaxagoras ſuppoſed the cauſe of earthquakes to be ſubterraneous clouds burſting out into lightning, which ſhook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual ſubterraneous fires, at length fell in. Others derived theſe accidents from the rarefied ſteam of waters, heated by ſome neighbouring fires; and ſome, among whom was Epicurus, and ſeveral of the Peripatetic ſchool, aſcribed theſe terrible accidents to the ignition of certain inflammable exhalations.

This laſt hypotheſis has been adopted by many of the moſt celebrated moderns, as Gaſſendus, Kircher, Schottus, Varenius, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philoſopher laſt mentioned indeed ſuppoſed, that waters prodigiouſly rarefied by heat might ſometimes occaſion earthquakes. The others ſuppoſed, as their hypotheſis neceſſarily requires, that there are many and vaſt cavities underground which have a communication with one another: ſome of which abound with waters; others with vapours and exhalations, ariſing from inflammable ſubſtances, as nitre, bitumen, ſulphur, &c. Theſe combuſtible exhalations they ſuppoſed to be kindled by a ſubterraneous ſpark, or by ſome active flame gliding through a narrow fiſſure from without, or by the fermentation of ſome mixture; and when this happened, they muſt neceſſarily produce pulſes, tremors, and ruptures at the ſurface, according to the number and diverſity of the cavities, and the quantity and activity of the inflammable matter. This hypotheſis is illuſtrated by a variety of experiments, ſuch as mixtures of iron-filings and brimſtone buried in the earth, gun-powder confined in pits, &c. by all which a ſhaking of the earth will be produced.

75
Hypotheſis of Dr Woodward.

Dr Woodward ſuggeſts another hypotheſis. He ſuppoſes that the ſubterraneous heat or fire, which is continually elevating water out of the abyſs, which, according to him, occupies the centre of the earth, to furniſh rain, dew, ſprings, and rivers, may be ſtopped in ſome particular part. When this obſtruction happens, the heat cauſes a great ſwelling and commotion in the waters of the abyſs; and at the ſame time, making the like effort againſt the ſuperincumbent earth, that agitation and concuſſion of it is occaſioned which we call an earthquake.

76
Of Mr Amontons.

Mr Amontons of the Royal Academy of Sciences ſuggeſts an hypotheſis entirely different from any of the above mentioned ones. According to the received philoſophical principles, which ſuppoſe the atmoſphere to be about 45 miles high, and that the denſity of the air increaſes in proportion to the abſolute height of the ſuperincumbent column of fluid; it is ſhown, that at the depth of 43,528 fathoms below the ſurface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only a 74th part of the ſemidiameter of the earth; and the vaſt ſphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condenſed, and much heavier than the heavieſt bodies we know of in nature. But it is found by experiment, that the more air is compreſſed, the more does the ſame degree of heat increaſe its ſpring, and the more capable does it render it of a violent effect; and that, for inſtance, the degree of heat of boiling water increaſes the ſpring of the air above what it has in its natural ſtate, in our climate, by a quantity equal to a third of the weight wherewith it is preſſed. Whence we may conclude, that a degree of heat, which on the ſurface of the earth will only have a moderate effect, may be capable of a very violent one below. And as we are aſſured, that there are in nature degrees of heat much more conſiderable than that of boiling water, it is very poſſible there may be ſome, whoſe violence, further aſſiſted by the exceeding weight of the air, may be more than ſufficient to break and overturn this ſolid orb of 43,528 fathoms; whoſe weight, compared to that of the included air, would be but a trifle.

77
All theſe hypotheſes rejected by Dr Stukely.

Though none of theſe hypotheſes were ſufficient for explaining the phenomena of earthquakes in a ſatisfactory manner, one or other of them continued to be adopted by almoſt all philoſophers till the year 1749. In the month of March that year, an earthquake was felt at London and ſeveral other places in Britain. Dr Stukely, who had been much engaged in electrical experiments, began to ſuſpect that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper publiſhed by him on this ſubject, he rejects all the above mentioned hypotheſes for the following reaſons.

1. That there is no evidence of any remarkable cavernous ſtructure of the earth; but that, on the contrary, there is rather reaſon to preſume that it is in a great meaſure ſolid, ſo as to leave little room for internal changes and fermentations within its ſubſtance; nor do coal-pits, he ſays, when on fire, ever produce any thing reſembling an earthquake.

2. In the earthquake at London, in March 1749, there was no ſuch thing as fire, vapour, ſmoke, ſmell, or an eruption of any kind obſerved, though the ſhock affected a circuit of 30 miles in diameter. This conſideration alone of the extent of ſurface ſhaken by an earthquake, he thought ſufficient to overthrow the ſuppoſition of its being owing to the expanſion of any ſubterraneous vapours. For as ſmall fire-balls burſting in the air propagate a ſulphureous ſmell to the diſtance of ſeveral miles, it cannot be ſuppoſed, that ſo immenſe a force acting inſtantaneouſly on that compaſs of ground ſhould never break the ſurface of it, nor become diſcoverable either to the ſight or the ſmell: beſides, that the operation of ſuch a fermentation would be many days in continuance, and the evaporation of ſo much inflammable matter would require a long ſpace of time. That ſuch an effect, therefore, ſhould be produced inſtantaneouſly, can be accounted for by electricity only; which acknowledges no ſenſible tranſition of time, no bounds.

3. If vapours and ſubterraneous fermentations, exploſions and eruptions, were the cauſe of earthquakes, they would abſolutely ruin the whole ſyſtem of ſprings and fountains, wherever they had once been; which is contrary to fact, even when they have been frequently repeated. Even in the earthquake in Aſia Minor, A. D. 17, which deſtroyed 13 great cities, and ſhook a maſs of earth 300 miles in diameter, nothing ſuffered but the cities; neither the ſprings nor the face of the country being injured, which indeed remains the ſame to this day.

4. That any ſubterraneous power ſufficient to move 30 miles in diameter, as in the earthquake which happened at London, muſt be lodged at leaſt 15 or 20 miles below the ſurface; and therefore muſt move an inverted cone of ſolid earth, the baſe of which is 30 miles in diameter, and the axis 15 or 20; an effect impoſſible to any natural power whatever, except electricity. So in Aſia Minor, ſuch a cone muſt have been 300 miles in the diameter of the baſe, and 200 in the axis; which not all the gun-powder that has been made ſince the invention of it, much leſs any vapours generated ſo far below the ſurface, could poſſibly effect.

5. A ſubterraneous exploſion will not account for the manner in which ſhips, far from land, are affected during an earthquake; which ſeem as if they ſtruck upon a rock, or as if ſomething thumped againſt their bottoms. Even the fiſhes are affected. A ſubterraneous exploſion would only produce a gradual ſwell, and not give ſo quick an impulſe to the water as would make it feel like a ſtone.

78
His method of accounting for earthquakes.

From comparing theſe circumſtances, the Doctor ſays, he had always thought that an earthquake was a ſhock of the ſame kind as thoſe which commonly occur in electrical experiments. And this hypotheſis was confirmed by the phenomena attending earthquakes; particularly thoſe of 1749 and 1750, which gave riſe to his publication.

The weather, for five or ſix months before, had been uncommonly warm; the wind ſouth and ſouth-weſt, without rain; ſo that the earth muſt have been in a ſtate peculiarly ready for an electrical ſhock. The flat country of Lincolnſhire had been under an exceeding great drought. The uncommonneſs of the firſt of theſe circumſtances, he remarks, is the reaſon why earthquakes are leſs frequently experienced in the northern than in the ſouthern regions of the world, where the warmth and dryneſs of the air, ſo neceſſary to electricity, are more uſual: And the latter ſhows how fit the dry ſurface was for an electrical vibration; and (which is of great importance) that earthquakes reach but little below the ſurface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward. And electricity is well known to quicken vegetation. The aurora borealis had been frequent about that time; and juſt before the earthquake, had been twice repeated in ſuch colours as had never been ſeen before. It had alſo removed ſoutherly, contrary to what is common in England; ſo that the Italians, and thoſe among whom earthquakes were frequent, actually foretold the earthquake. The year had been remarkable for fire-balls, lightning, and coruſcations; and theſe are rightly judged to be meteors of an electrical nature.

In theſe circumſtances of the earth and air, nothing, he ſays, is wanting to produce an earthquake, but the touch of ſome non-electric body; which muſt neceſſarily be had *ab extra* from the region of the air or atmoſphere. Hence he infers, that if a non-electric cloud diſcharge its contents upon any part of the earth, in that highly electrical ſtate, an earthquake muſt neceſſarily enſue. As the diſcharge from an excited tube produces a commotion in the human body, ſo the diſcharge of electric matter from the compaſs of many miles of ſolid earth muſt needs be an earthquake; and the ſnap from the contact, the horrid uncouth noiſe attending it.

The Doctor had been informed by thoſe who were up and abroad the night preceding the earthquake, and early in the morning, that coruſcations in the air were extremely frequent; and that a little before the earthquake, a large and black cloud ſuddenly covered the atmoſphere, which probably occaſioned the ſhock by the diſcharge of a ſhower.

A ſound was obſerved to roll from the Thames towards Temple Bar before the houſes ceaſed to nod, juſt as the electrical ſnap precedes the ſhock. This noiſe (which generally precedes earthquakes) the Doctor thought could be accounted for only on electrical principles: for, in a ſubterraneous eruption, the direct contrary would happen.

The flames and ſulphureous ſmells, which are ſometimes obſerved in earthquakes, might, he thought, be more eaſily accounted for, on the ſuppoſition of their being electrical phenomena, than from their being occaſioned by eruptions from the bowels of the earth. So alſo the ſuddenneſs and expedition of the concuſſion, it being felt at the ſame inſtant over ſuch a large ſurface, and the little damage alſo which earthquakes generally occaſion; ſufficiently point out what ſort of a motion it is: not a convulſion of the bowels of the earth; but an uniform vibration along its ſurface, like that of a muſical ſtring, or a glaſs when rubbed on the edge with one's finger.

The circumſtance of earthquakes chiefly affecting the ſea-coaſt, places along rivers (and, adds Doctor Prieſtley, eminences), is a farther argument of their being electrical phenomena. This is illuſtrated by a particular account of the direction in which the earthquake was conveyed.

The laſt argument he uſes is taken from the effects which it had on perſons of weak conſtitutions, who were, for a day or two after it happened, troubled with pains in the back, rheumatiſms, hyſterics, and nervous diſorders; juſt in the ſame manner as they would have been after an actual electrification: to ſome theſe diſorders proved fatal.

As to the manner in which the earth and atmoſphere are put into this ſtate, which prepares them to receive ſuch a ſhock, and whence the electric matter comes, the Doctor does not pretend to determine; but thinks it as difficult to be accounted for as magnetiſm, gravitation, and many other ſecrets of nature.

79
Hypotheſis of S. Beccaria;

The ſame hypotheſis was advanced by Signior Beccaria, without knowing any thing of Dr Stukeley's diſcoveries. But this learned Italian imagined the electric matter which occaſions earthquakes to be lodged deep in the bowels of the earth, agreeably to his hypotheſis concerning lightning.

Now, as it appears that the quantity of electric matter in the ſimpleſt thunder-ſtorms is ſo inconceivably great, that it is impoſſible to be contained by any cloud or number of clouds; and as, during the progreſs of a thunder-ſtorm which he obſerved, though the lightning frequently ſtruck to the earth, the ſame clouds were the next moment ready to make a ſtill greater diſcharge; it was evident, that they muſt have received at one place, the moment a diſcharge was made from them in another. Let us ſuppoſe theſe clouds ever ſo great, if the lightning proceeded only from them, the quantity muſt be leſſened by every diſcharge; and no recruits that any new clouds might bring can bear any proportion to the diſcharge which muſt enſue from the colliſion of ſo great a number as combine to form a thunder-ſtorm. It ſeems therefore moſt likely, that the electric matter is continually darting from the clouds in one place, at the ſame time that it is diſcharged from the earth in another; and, conſequently, that the clouds ſerve as conductors to convey the electric fluid from thoſe places of the earth which are overloaded with it, to thoſe which are exhauſted.

This theory being admitted, there will, he thinks, be little difficulty in attributing earthquakes to the ſame cauſe. For if the equilibrium of the electric matter be by any means loſt in the bowels of the earth; ſo that the beſt method of reſtoring it ſhall be by the fluid burſting into the air, and traverſing ſeveral miles of the atmoſphere, to come at the place where it is wanted; it may be eaſily imagined, that violent concuſſions will be given to the earth by the ſudden paſſage of ſo powerful an agent. This, in his opinion, was confirmed by the flaſhes of light, exactly reſembling lightning, which have been frequently ſeen to ruſh from the top of Mount Veſuvius, at the time that aſhes and other light matters have been carried out of it into the air, and diſperſed uniformly over a large tract of country. And it is well known, that volcanoes have a near connection with earthquakes.

A rumbling noiſe like thunder, and flaſhes of light riſing from the ground, have been generally obſerved to attend earthquakes. And lightning itſelf has been known to be attended with ſmall ſhakings of the earth. So alſo *ignes fatui*, in mines, he looked upon as an argument that the electric fluid was ſometimes collected in the bowels of the earth.

80
Of Dr Prieſtley.

Dr Prieſtley, in his Hiſtory of Electricity, obſerves upon theſe theories, that a more probable hypotheſis may perhaps be formed out of both of them. "Suppoſe (ſays he) the electric matter to be, ſome way or other, accumulated on one part of the ſurface of the earth, and on account of the dryneſs of the ſeaſon not eaſily to diffuſe itſelf; it may, as Signior Beccaria ſuppoſes, force its way into the higher regions of the air, forming clouds in its paſſage out of the vapours which float in the atmoſphere, and occaſion a ſudden ſhower, which may further promote the paſſage of the fluid. The whole ſurface, thus unloaded, will receive a concuſſion, like any other conducting ſubſtance, on parting with, or receiving a quantity of the electric fluid. The ruſhing noiſe will likewiſe ſweep over the whole extent of the country. And upon this ſuppoſition alſo, the fluid, in its diſcharge from the country, will naturally follow the courſe of the rivers, and alſo take the advantage of any eminences to facilitate its aſcent into the higher regions of the air."

The Doctor, making experiments with a battery on the paſſage of the electrical fluid over different conducting ſubſtances, and, among theſe, over water;—and remarking a reſemblance between its paſſage over the ſurface of the water, and that which Dr Stukeley ſuppoſed to ſweep the ſurface of the earth, when a conſiderable quantity of it is diſcharged to the clouds during an earthquake; immediately ſuſpected that the water over which it paſſed, and which was viſibly thrown into a tremulous motion, muſt receive a concuſſion reſembling that which is given to the waves of the ſea on ſuch an occaſion.

To try this, he himſelf and others preſent put their hands into the water at the time that the electrical flaſh paſſed over its ſurface; and they felt a ſudden concuſſion given to them, exactly like that which is ſuppoſed to affect ſhips at ſea during an earthquake. This percuſſion was felt in various parts of the water, but was ſtrongeſt near the place where the exploſion was made. The ſame experiment, with a little variation, being afterwards made with a ſingle jar, at ſome diſtance below the ſurface of the water, produced the like effect, though in a weaker degree. "This ſimilarity in the effect (the Doctor obſerves) is a conſiderable evidence of a ſimilarity in the cauſe.

"Pleaſed with this reſemblance of the earthquake (ſays he), I endeavoured to imitate that great natural phenomenon in other reſpects: and it being froſty weather, I took a plate of ice, and placed two ſticks about three inches high on their ends, ſo that they would juſt ſtand with eaſe; and upon another part of the ice I placed a bottle, from the cork of which was ſuſpended a braſs ball with a fine thread. Then, making the electrical flaſh paſs over the ſurface of the ice, which it did with a very loud report, the nearer pillar fell down, while the more remote ſtood; and the ball which had hung nearly ſtill, immediately began to make vibrations about an inch in length, and nearly in a right line from the place of the flaſh.

"I afterwards diverſified this apparatus, erecting more pillars, and ſuſpending more pendulums, &c. ſometimes upon bladders ſtretched on the mouth of open veſſels, and at other times on wet boards ſwimming in a veſſel of water. This laſt method ſeemed to anſwer the beſt of any: for the board repreſenting the earth, and the water the ſea, the phenomena of them both during an earthquake may be imitated at the ſame time; pillars, &c. being erected on the board, and the electric flaſh being made to paſs either over the board, over the water, or over them both."

81
Deficiency of all theſe hypotheſes.

Theſe three hypotheſes concerning the cauſe of earthquakes, though ſomewhat differing from one another, yet agree in the main; but if a particular ſolution of the phenomena is required, every one of them will be found deficient.

If, according to Dr Stukeley's hypotheſis, the electric matter is lodged only on the ſurface of the earth, or but at a ſmall depth below, how are we to account for thoſe violent effects which often take place in the bowels of the earth? In the earthquake at Liſbon, a large quay ſunk to an unfathomable depth. We are certain that the cauſe of the earthquake muſt have been below this depth, however great it was, and have opened the earth for an immenſe way downwards. At the ſame time an hill in Barbary clave aſunder, and the two halves of it fell different ways. This ſhows, that the cauſe of the earthquake operated not on the ſurface of the hill, but on the ſolid foundation and contents of it; nor can it be explained by any ſuperficial action whatever. From what the miners at Eyam bridge in Derbyſhire obſerved, it is alſo evident, that the ſhock was felt at the depth of 396 feet below the ſurface of the ground more than at the ſurface itſelf; and conſequently there is all the reaſon in the world to think that the cauſe lay at a depth vaſtly greater.

Again, though the earthquake at London was ſuppoſed to begin with a black cloud and ſhower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and ſerene almoſt in every place where it was felt. It doth not appear that there is at any time a conſiderable difference between the electricity of the atmoſphere and that of the earth, or indeed that there can be ſo. For if the earth is electrified *plus* and the atmoſphere *minus*, there are innumerable points on the ſurface of the earth which muſt be imperceptibly drawing off the ſuperfluous electric matter into the air. The vapours alſo, with which the atmoſphere abounds, would always be ready in the ſame ſervice; and thus thunder and lightning might indeed ſometimes be produced, but not earthquakes. But laſtly, neither the air nor the earth does always ſhow any remarkable ſigns of electricity before earthquakes happen. For, the ſummer before the earthquake at Mancheſter in 1777, there had ſcarce been any thunder, lightning, or other ſigns of electricity in the atmoſphere, and vegetation had been extremely backward; and, according to the beſt accounts, the weather continued remarkably fine.

For theſe reaſons, Dr Stukeley's hypotheſis ſeems not to be ſatisfactory. That of Signior Beccaria is not indeed liable to the above mentioned objections; but ſeems highly improbable on another account. The atmoſphere is known to be a ſubſtance through which the electric matter makes its way with the utmoſt difficulty. It is a vaſtly worſe conductor than water or than moiſt earth. If therefore the equilibrium of this fluid is loſt in the bowels of the earth, it is impoſſible to give a reaſon why it ſhould not rather go to the places where it is wanted through the earth itſelf, than through the atmoſphere. Beſides, if this was the caſe, the ſhock of an earthquake could only be felt at thoſe places where the electric fluid iſſued from the earth, and where it entered. All the intermediate places ought to be free from any ſhock, and to be ſenſible only of a violent concuſſion in the atmoſphere; but of this we have no example in any hiſtory of earthquakes whatever.

Dr Prieſtley's hypotheſis is liable to the ſame objections with that of Dr Stukeley; for any ſuperficial operation will never account for thoſe effects above mentioned, which take place at great depths below the ſurface. His experiment cannot be admitted as any way concluſive with regard to the cauſe of earthquakes, becauſe no quantity of electric fire is ſeen to paſs over the

the earth and ſea, like the flaſh attending the exploſion of an electric battery; and the force of his earthquake (being but juſt able to throw down a ſtick that could hardly ſtand by itſelf) ſeems by far too little. The utmoſt force of electricity which man can raiſe, is indeed very trifling, when compared with the great operations of nature: but it is certain, that the force of an electric battery is by no means contemptible; and was its whole power to be employed in producing an imitation of an earthquake, it certainly would do much more than throw down a ſmall ſtick. The bad ſucceſs of this experiment therefore ſhows, that the Doctor's theory is erroneous: for almoſt the whole of his electric power was ſpent another way; and we cannot ſuppoſe that any conſiderable part of the force which produces earthquakes is ſpent any other way than in the very production of the earthquake itſelf.

82
Principles on which the phenomena may be explained.

If it is attempted to give an explanation of the phenomena of earthquakes, which ſhall be free from the objections above mentioned, and from all others, it will be neceſſary, in the firſt place, to conſider thoſe parts of the ſyſtem of nature which ſeem to be moſt affected during the terrible phenomena we treat of. Theſe parts are, the air, the ſolid earth, and the water. Of theſe the two former are electrics *per ſe*; the latter is a conductor, though a bad one *. Hence it follows,

1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric *per ſe*, and *vice verſa*.

2. It alſo follows, that whatever quantity of electricity is communicated to the ſolid earth, will be quickly taken off from it by the water which is mixed with it, in the ſame manner that the electric matter is carried off from an excited globe by a metallic conductor.

3. The whole earth is moiſt, and therefore in ſome degree a conductor. Nevertheleſs, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glaſs, it is therefore poſſible, that the electric power of the earth may be excited to ſuch a degree, that the moiſture of the ſolid parts cannot eaſily contain the quantity of electricity communicated.

4. In this caſe, the earth muſt either give undoubted ſigns of its being excited in the ſame manner that other excited electrics do, or the electricity muſt be diſcharged ſomewhere elſe.

5. To receive any ſuperfluous quantity of electric matter that may be communicated to the ſolid earth, the waters of the ocean are always ready. Theſe, being a much better conductor than earth, muſt be a principal mean of preſerving the equilibrium of electricity in the different parts of the earth; and hence we ſee a natural reaſon why the waters of the ocean ſhould cover ſo large a proportion of the globe as they are known to do. See OCEAN.

6. It is known, that fire is alſo a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the ſolid earth, if it can neither be conveniently received by the moiſture which the earth naturally contains, nor by the ocean in its neighbourhood, it will diſcharge itſelf by any volcano that happens to be in an active ſtate, near the place where that collection of electric matter is.

7. It is alſo found, that the electric fluid, being violently reſiſted by the ſuperincumbent atmoſphere, hath always a tendency to diſcharge itſelf in thoſe places where that reſiſtance is leaſt. The tops of high mountains, therefore, where the weight of the atmoſphere is greatly diminiſhed, will alſo afford a ready paſſage for the electric fluid when it is collected in very great quantity in the bowels of the earth.

8. If, from ſome natural cauſes, the electric matter ſhall happen to be collected in the bowels of the earth in any particular place, and at the ſame time ſuch obſtacles are thrown in its way, that it can neither diſcharge itſelf into the ocean, nor into the atmoſphere by the tops of high mountains, nor by the more open paſſages of volcanoes; the moſt terrible conſequences muſt enſue: the matter being pent up, and the cauſe by which it is collected continuing ſtill to act, its impulſe becomes at laſt irreſiſtible. It then flies againſt every obſtacle with inconceivable violence. It breaks out in all thoſe places where there is the leaſt reſiſtance, and therefore the ſhock is directed a great number of different ways at once. Houſes, ſteeples, trees, &c. by their height take off ſomewhat of the preſſure of the atmoſphere; and therefore the electric matter flies againſt them very violently. The houſes and other buildings being bad conductors, are thrown down; the trees affording a readier paſſage to the fluid are not hurt, though even they alſo are ſometimes ſplit. The height of the mountains renders them the objects of the deſtructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown down from them. The water contained in the ſolid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulſe of the reſt, and therefore is thrown out of the earth in great quantities. For the ſame reaſon, the waters on the ſurface of the earth are moſt violently agitated. The ſmall quantities contained in wells are thrown out at the tops of them: The rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, riſe in billows: The ocean itſelf, receiving more electric matter than can be immediately diſperſed through the whole body of water, or evaporate into the atmoſphere, retreats from the land, and is raiſed in vaſt mountains. The ſolid earth, being unable either to conduct the fluid quietly to thoſe parts where it is wanted, or to retain it, is violently ſhaken or rent in multitudes of places; and this not only on the ſurface, but to great depths. The electricity being now in ſome meaſure diſcharged from the earth, the ocean ruſhes forward with fury to diſcharge in its turn the exceſs of electric matter it juſt before received from the earth. If there are volcanoes in the neighbourhood, the violent diſcharge of electricity is ſure to manifeſt itſelf by ſetting them in a flame; and thus, till the equilibrium is reſtored, all nature ſeems to be threatened with diſſolution.—Even in thoſe places where the force of the electric fluid is not able to ſhake the ſolid parts of the earth, it manifeſts its power by agitating the waters in the manner above deſcribed. Water being a much better conductor of electricity than earth, this ſubtile fluid, as ſoon as it can get out from the ſolid earth, flies to the water. The conſequence is, that the water immediately ſwells up, and

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* See *Electricity*.

is attracted by whatever part of the earth has leſs electricity than itſelf. Hence thoſe ſtrange irregular motions of the waters in different places, ſo particularly obſerved at the time of the earthquake at Liſbon; and which it ſeems impoſſible to account for from any other cauſe than an immediate diſcharge of electric matter from the earth into them.

9. As it is impoſſible that any part of the earth can be electrified without communicating a proportionable ſhare of electricity to the animals that live upon it, and have a conſtant communication with it, it thence follows, that there can be no conſiderable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who ſeem to be more ſenſible of ſuch commotions than we, run about, and ſhow ſigns of fear, before the earthquake comes on; and hence the giddineſs, ſickneſs, &c which the human race are ſubject to during the time of the ſhock, even though they do not feel it, as was the caſe at Gibraltar.

10. As the atmoſphere hath a communication with the earth, it is ſcarce to be ſuppoſed that the earth can, for any length of time, contain a conſiderable quantity of electric matter, without communicating to the atmoſphere a proportionable quantity. Before an earthquake, therefore, we muſt ſuppoſe the electricity of the earth and air to be in perfect equilibrio. Hence the weather is ſerene, there is no wind, nor any other ſign in the atmoſphere, of the terrible cataſtrophe that is about to enſue. But the moment the diſcharge is made from the earth, the equilibrium between the terreſtrial and atmoſpherical electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder-clouds by which the electricity may be brought down in ſudden flaſhes of lightning, the fluid breaks through the ſubſtance of the air itſelf with diſmal and horrid noiſes, which always accompany an earthquake. That this is the caſe, ſeems highly probable from an experiment of M. de Romas, when, having brought down a vaſt quantity of electric matter from the clouds by means of a kite, he heard the noiſe it made in the air, like the continual blowing of a ſmall forge bellows. In general, a conſiderable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, ſoon after, there was a great deal of thunder and lightning in the ſouthern parts of Scotland: which ſeems to indicate, that the electric fluid diſcharged from the earth in England had taken its courſe northward, and produced the phenomena before mentioned in Scotland. The ſame obſervation may likewiſe be made with regard to 1789, when there were ſlight ſhocks of an earthquake both in England and Scotland. That in England being the firſt, was followed by an uncommon frequency of thunder and lightning in the ſouthern parts of Scotland; by reaſon of the progreſs of the electric matter northward after it was diſcharged into the atmoſphere: but the ſhocks which happened in the northern part of Scotland (*viz.* about Crief in Stirlingſhire) were not followed by any thunder to the ſouthward; becauſe the electric matter, though diſcharged into the atmoſphere, cannot return to the ſouth without firſt going north, and riſing up into the higher regions.

83
Circumſtances in the earthquakes of 1783 ſeemingly oppoſite to this theory.

In the earthquakes in Calabria, in the year 1783, there were ſome circumſtances which ſeem to militate againſt the theory juſt now laid down. The moſt remarkable of theſe is their attacking the places ſituated on the plain much more than thoſe which ſtood on the higher grounds. This is particularly inſiſted upon by Sir William Hamilton. “If two towns (ſays he) were ſituated at an equal diſtance from the centre (of the force of the earthquake), the one on a hill, the other on the plain or in a bottom, the latter always ſuffered greatly more from the ſhocks of the earthquake than the former; a ſufficient proof to me of the cauſe coming from beneath, as this muſt naturally have been productive of ſuch an effect. And I have reaſon to believe, that the bottom of the ſea, being ſtill nearer the volcanic cauſe, would be found, if it could be ſeen, to have ſuffered ſtill more than the plain itſelf: but the philoſophers, who do not eaſily abandon their ancient ſyſtems, make the preſent earthquakes to proceed from the high mountains of the Apennines that divide Calabria Ultra, ſuch as the Monte Dejo, Monte Caulone, and Aſpramonte. I would aſk them this ſimple queſtion, Did the Eolian or Lipari iſlands (all which roſe undoubtedly from the bottom of the ſea by volcanic exploſions, at different and perhaps very diſtant periods) owe their birth to the Apennines in Calabria, or to veins of minerals in the bowels of the earth and under the bottom of the ſea? Stromboli, an active volcano, and probably the youngeſt of thoſe iſlands, is not above 50 miles from thoſe parts of Calabria that have ſuffered moſt by the late earthquakes. The vertical ſhocks, or, in other words, thoſe whoſe impulſe was from the bottom upwards, have been the moſt deſtructive to the unhappy towns in the plain. Did they proceed from Monte Dejo, Monte Caulone, or Aſpramonte? In ſhort, the idea I have of the preſent local earthquakes is, that they have been cauſed by the ſame kind of matter that gave birth to the Eolian iſlands; that perhaps an opening may have been made at the bottom of the ſea, and moſt probably between Stromboli and Calabria Ultra; for from that quarter all agree that the ſubterraneous noiſes ſeem to have proceeded; and that the foundation of a new iſland or volcano may have been laid, though it may be ages, which to nature are but moments, before it is completed and appears above the ſurface of the ſea. Perhaps, too, the whole deſtruction I have been deſcribing may have proceeded ſimply from the exhalations of confined vapours generated by the fermentation of ſuch minerals as produce volcanoes, which have eſcaped where they meet with the leaſt reſiſtance, and muſt naturally, in a greater degree, have affected the plain than the high and ſolid grounds around it.”

84
This earthquake leſs violent among the Apennine mountains than elſewhere.

85
Sir William Hamilton's opinion of the cauſe.

86
Electricity denied by M. Dolomieu to have any ſhare in the production of earthquakes.

In a memoir on this earthquake by M. Dolomieu, that author endeavours to exclude electricity from having had any ſhare in the matter. “The ſea (ſays he), during the earthquakes of 1783, had little ſhare in the ſhocks of the main land. The maſs of water experienced no general movement of fluctuation or oſcillation; the waves did not riſe above their ordinary limits. Thoſe which, on the night of the 5th of February, beat againſt the coaſt of Scilla, and which afterwards covered the point of the Faro of Meſſina, were only the effects of a particular cauſe. The fall of a mountain into the ſea raiſed the waters, which received an undulating motion, as happens always in ſimilar caſes. The undulation reached from the point of Sicily beyond the Cape of Roſacolmo, extending in length along the coaſt which runs to the ſouth; but always with a decreaſe in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to diſcover, in all the details which have been given him, any proofs of the exiſtence of electrical phenomena: no ſpark, no diſengagement of the electrical fluid, which the Neapolitan naturaliſts wiſh to aſſign as the cauſe of earthquakes.

87 Of the ſtate of the atmoſphere.

"The ſtate of the atmoſphere was not the ſame in the whole range of earthquakes. While the tempeſts and the rain ſeemed to have conſpired with them for the deſtruction of Meſſina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the ſky was clear during the reſt of the day. This month and that of March were not only pretty ſerene, but likewiſe warm. There were ſome ſtorms and rain; but they were the natural attendants of the ſeaſon.

88 Subterraneous fire ſuppoſed to be the cauſe.

"The moving force ſeems to have reſided under Calabria itſelf, ſince the ſea which ſurrounds it had no ſhare in the oſcillations or vibrations of the continent. This force ſeems alſo to have advanced along the ridge of the Apennines in aſcending from the ſouth to the north. But what power in nature is capable of producing ſuch effects? I exclude electricity, which cannot accumulate continually during the courſe of a year, in a country ſurrounded with water, where every thing conſpires to place this fluid in equilibrio. Fire remains to be conſidered. This element, by acting directly upon the ſolids, can only dilate them; then their expanſion is progreſſive, and cannot produce violent and inſtantaneous movements. When fire acts upon fluids, ſuch as air and water, it gives them an aſtoniſhing expanſion; and we know that then their elaſtic force is capable of overcoming the greateſt reſiſtances. Theſe appear the only means which nature could employ to operate the effects we ſpeak of; but in all Calabria there is no veſtige of a volcano; nothing to point out any interior combuſtion; no fire concealed in the centre of mountains, or under their baſe; a fire which could not exiſt without ſome external ſigns. The vapours dilated, the air rarefied by a heat conſtantly active, muſt have eſcaped through ſome of the crevices or clefts formed in the ſoil; they muſt there have formed currents. Both flame and ſmoke muſt have iſſued by ſome one or other of theſe paſſages. Theſe once opened, the preſſure would have ceaſed; the force not meeting with any more reſiſtance, would have loſt its effect; and the earthquakes could have no longer continued. None of theſe phenomena took place: we muſt then renounce the ſuppoſition of a combuſtion acting directly under Calabria. Let us ſee if having recourſe to a fire at ſome diſtance from this province, and acting upon it only as an occaſional cauſe, we ſhall be able to explain all the phenomena which have accompanied the ſhocks. Let us take for example Ætna in Sicily, and ſuppoſe large cavities under the mountains of Calabria; a ſuppoſition which *cannot be refuſed*. It is certain that immenſe ſubterraneous cavities do exiſt, ſince Ætna, in elevating itſelf by the accumulation of its exploſions, muſt leave in the heart of the earth cavities proportioned to the greatneſs of the maſs.

89 Whence a ſupply of water ſufficient to produce ſuch effects might be derived.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by thoſe of the ſurface, may have run into thoſe caverns which form the focus of Ætna: there they muſt have been converted into vapour capable of the higheſt degree of expanſion, and muſt have preſſed forcibly againſt every thing which oppoſed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occaſion there all the calamities of which I have given the deſcription.

"If the firſt cavity is ſeparated from the ſecond by a wall (ſo to ſpeak) or ſome ſlight diviſion, and this ſeparation is broken down by the force of the elaſtic vapour, the whole force will act againſt the bottom and ſides of the ſecond. The focus of the ſhocks will appear to have changed place, and become weaker in the ſpace which was agitated moſt violently by the firſt earthquake.

"The plain, which was undoubtedly the moſt ſlender part of the vault, yielded moſt eaſily. The city of Meſſina, placed upon low ground, experienced a ſhock which the buildings on higher grounds did not. The moving force ceaſed at once as ſuddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain ſcarce ſuffered any thing. The ſubterraneous noiſe, which preceded and accompanied the ſhocks, appeared always to come from the ſouth-weſt, in the direction of Meſſina. It ſeemed like thunder under ground, which reſounded beneath vaults.

"If Ætna, then, has been the occaſional cauſe of the earthquakes, it has alſo prepared, for ſome time, the misfortunes of Calabria, by gradually opening a paſſage along the coaſt of Sicily to the foot of the Neptunian mountains: for during the earthquakes of 1780, which diſturbed Meſſina the whole ſummer, they felt, the whole length of that coaſt, from Taormina even to the Faro, conſiderable ſhocks; but near the village of Alli and Fiume de Niſi, which are ſituated about the middle of that line, ſhocks ſo violent were experienced, that they dreaded leſt the mouth of a volcano ſhould open. Each ſhock reſembled the effort of a mine that had not ſtrength to make an exploſion. It appears, that then the volcano opened a free paſſage for the expanſion of its vapours, and that they have ſince circulated without reſtraint; ſince in the year 1783 the earthquake was almoſt nothing upon that part of Sicily, at the time that Meſſina buried under its ruins the half of its inhabitants."

90 Diſagreement with regard to facts betwixt M. Dolomieu and Sir William Hamilton.

On this theory it is firſt to be obſerved, that there is a conſiderable diſagreement in points of *fact* betwixt M. Dolomieu and Sir William Hamilton. The former could find no account of any ſpark or other electrical phenomenon: the latter, on the contrary, was aſſured that flames had often been ſeen to iſſue from the earth; and theſe he expreſsly attributes to a vapour charged with *electrical fire*. M. Dolomieu takes little notice of the rains that fell; while Sir William Hamilton attributes to them ſeveral of thoſe diſruptions of the earth, which, without them, would have ſeemed very extraordinary. The latter likewiſe informs us,

91
Proofs of electricity being concerned.

92
M. Dolomieu's hypotheſis inſufficient.

us, that before a ſhock the clouds remained motionleſs; and that, after a heavy ſhower of rain, a ſmart ſhock followed. Theſe were phenomena that ſhowed ſome connection between what paſſed in the earth and in the atmoſphere: but betwixt theſe two there is no agent that we know of excepting electricity, at leaſt there is none of ſufficient ſtrength to produce any violent effects by communication between the one and the other. The moſt enthuſiaſtic imagination cannot ſuppoſe that huge cauldrons of boiling water under Mount Ætna ſhould make the clouds ſtand ſtill over Calabria; and the quick ſucceſſion of the ſhock to an heavy ſhower of rain ſhowed that the cauſe, whatever it was, lay in the ground on which the rain fell, and that it could be put in action by what affected the ſurface of the ground. But the cauſe of earthquakes appears, from the facts related n° 25, to lie at a greater depth in the earth than 396 feet; but no ſhower of rain could affect the earth to this depth unleſs by making ſome alteration in its electricity. Theſe phenomena, which M. Dolomieu has overlooked, evidently ſhow that electricity was concerned in this earthquake as well as others.

93
Of the foreknowledge which brute animals had of the ſhock.

Another circumſtance, which M. Dolomieu himſelf mentions, is a ſufficient proof of electricity being concerned; and that is the preſentiment which animals had of its approach. "The preſentiment of animals (ſays he) at the approach of earthquakes, is a ſingular phenomenon, and which cannot fail to ſurpriſe us ſo much the more, as we know not by what organs it is communicated to them. Every ſpecies of animals experiences it, eſpecially dogs, geeſe, and poultry. The howlings of the dogs in the ſtreets of Meſſina were ſo loud, that orders were iſſued to kill them." Now, we know that many animals have a preſentiment of a change of weather; which may happen either from a change of the denſity of the atmoſphere, or from ſome alteration in its electricity: but ſteam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewiſe informs us, that geeſe ſeemed more affected by this cauſe when in the water than out of it; which may eaſily be explained upon electrical principles, but not at all, at leaſt not without the moſt extravagant ſuppoſitions, by ſteam pent up in caverns nobody knows where.

94
Erroneous method of arguing purſued by M Dolomieu.

95
The earthquakes could not be occaſioned by water poured into Mount Ætna.

Again, it is evident that Mr Dolomieu's hypotheſis is ſupported in the worſt manner imaginable, viz. by arguing from things unkown to what we ſee; but the true method of argument always is from what we ſee to things unknown. By this unhappy error he has made choice of cauſes which cannot poſſibly anſwer the purpoſe. Let any quantity of water we pleaſe be poured into the focus of mount Ætna; nay, let the ſea itſelf break into it: the conſequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vaſt effuſion of boiling water from the top of the mountain itſelf. Nature here made the experiment; and we have no reaſon to imagine that any other conſequence would have followed, though it had been repeated ever ſo often. Our author ſeems alſo to have forgot, that aqueous ſteam is capable of condenſation, and that when it is admitted into a cold place it inſtantly loſes its expanſive power. Let us ſuppoſe caverns upon caverns extended in any way he pleaſes: the greater their bulk, the more will he be embarraſſed; for thus the ſteam would have room to circulate; and far from producing thoſe dreadful convulſions, muſt have returned quietly into water, without being able to ſtir the earth in the leaſt. It would appear indeed, that the power of aqueous ſteam is very much over-rated both by M. Dolomieu and other writers. An anonymous author in the *Journal de Phyſique* for Auguſt 1785, has drawn a compariſon between volcanoes and ſteam-engines; and expreſſes his ſurpriſe that nobody has taken notice of it ſooner. "A ſteam-engine (ſays he), conſiſts of a caldron or boiler, covered with a lid, having an opening in the middle, to which is fitted an hollow cylinder, &c. The boiler is ſet over a fire, and from the water in it riſes a vapour, the expanſive force of which raiſes the piſton of the machine. The action of the vapour is afterwards inſtantaneouſly annihilated by a jet of cold water into the cylinder through a hole, when the weight of the atmoſphere takes place, forces down the piſton, and conſequently raiſes the water in the pump.

96
Compariſon between volcanoes and ſteam-engines.

"It is known that vapour occupies a ſpace 15,000 or 16,000 times greater than the bulk of the water which produced it; hence it follows, that the ſmaller the ſpace is in which it is contained, the force of its expanſion will be the greater. It has ſometimes happened, that vapour, in a ſteam-engine, not having ſufficient play, has burſt the veſſels in which it was contained, deſtroyed the building, and thrown the ſtones and boiling water to a great diſtance. It is now furniſhed with holes, by which the quantity of water can be aſcertained, and with a valve which gives way when the vapour is ſuperabundant. When the vapour iſſues by this valve, it ſtrikes the air with ſuch force as to occaſion a very loud hiſſing noiſe. The force of vapour ſufficient for raiſing a piſton of a given diameter is equal to the weight of a column of water 22 feet in height, and of a baſe equal to the piſton; ſo that, ſuppoſe a cubic foot of water to weigh 70 pounds, and the piſton to be a foot ſquare, the force of the vapour ſufficient for raiſing it will be 1540 pounds; an agent ſo powerful, that hardly any thing elſe in nature can be compared with it.

97
Volcanoes, earthquakes, &c. all ſuppoſed to be owing to ſteam.

"Now if we recollect the deſcriptions of volcanoes, their eruptions, the earthquakes and hiſſing noiſes which ſometimes precede or accompany them; the ſtones of different ſorts, boiling water, ſulphur, and bitumens which they diſcharge; if we hear of rocks thrown to the diſtance of ſeven or eight miles from the mouth of the volcano; clouds of aſhes, and torrents of lava, ſeas overflowing, rivers left dry, &c. &c. we will find all theſe the effects of great natural ſteam-engines: that is to ſay, they are produced by maſſes of combuſtible matter ſet on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the ſea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberleſs caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raiſed by men, are merely the lid or covering, more or leſs thick, of theſe caverns, which vary in ſhape, and in the materials of which they are compoſed. Places therefore covered with buildings and mountains, are more liable to earthquakes, becauſe they are leſs able to give way to the ſhock: and the farther places are diſtant from volcanoes, the leſs they have to fear from earthquakes; becauſe the vapour having room to expand itſelf by the ramifications of the ſubterraneous paſſages, the ſhocks will be leſs violent and leſs frequent. It is this which, in all probability, has hitherto ſaved Naples.

"Now, let it not be ſaid, that we have miſtaken the cauſe of earthquakes: for if, on the one hand, we attentively conſider the ſteam-engine and its effects, and on the other, obſerve volcanoes always in the neighbourhood of water, we will be convinced, that they differ in nothing from that machine, but becauſe this is under the command and direction of art. The diſappearance and formation of iſlands and mountains may be explained from the ſinking in of caverns, or from their being lifted up by the force of vapour.—Laſtly, thoſe vapours which, in the year 1783, covered at the ſame time, and almoſt during four months, a part of Europe, Aſia, and Africa, were probably vapour eſcaped from thoſe great internal caverns, heated by a ſufficient quantity of combuſtible matters, ſet on fire by fermentation in the great chemical laboratories in the bowels of the earth. In certain diſtricts of Burgundy, theſe vapours were found to be hot, for they dried up and deſtroyed the grapes."

98 This hypotheſis utterly inſufficient.

99 Exceſſive preſſure of the atmoſphere to be overcome before an earthquake can take place.

100 Power of ſteam generally over-rated.

101 Exploſion of water with copper probably occaſioned by a decompoſition.

That the power of ſteam-engines is very great, there is no doubt; but all that we ſee them uſually perform, is little more than merely overcoming the preſſure of the atmoſphere on the piſton of the cylinder. Now this preſſure is equally ſtrong over the whole ſurface of the earth; ſo that before the ground could be ſhaken in the ſmalleſt degree, the whole preſſure of the atmoſphere incumbent upon it muſt be removed. But if we begin to make any calculations with regard even to this force, which muſt be removed as a preliminary, we ſhall find it to be inconceivably great. A ſquare mile contains 27,878,400 ſquare feet; and upon each of theſe the preſſure is 2160 pounds. The atmoſpherical preſſure on a ſquare mile is the product of theſe two numbers, or 60,217,344,000 pounds; but the great earthquake of 1755 ſhook no leſs than 4,000,000 of ſquare miles of the earth; and therefore muſt in the firſt place have overcome a preſſure of more than 240,000 millions of millions of pounds: and after all this, it had ſtill a much greater obſtacle, viz. the immenſe weight and coheſion of the earth itſelf. Dr Stukely* has calculated, that no conceivable quantity of gunpowder could have moved the earth ſhaken by the earthquake in Aſia Minor, which affected a circle of 300 miles diameter: but the earthquake of 1755 muſt have required not only a much greater power to move the earth, as affecting a ſurface much greater than that of a circle 300 miles in diameter, but alſo the atmoſpherical preſſure above mentioned, which does not enter into the Doctor's calculation. There cannot therefore be any conceivable quantity of water, of fire, or of ſteam in the bowels of the earth, ſufficient to produce ſuch effects; nor is there any power in nature to which we can with the ſmalleſt probability attribute them, electricity alone excepted. Calculations have indeed been made, that the force of ſteam is 28 times greater than that of gunpowder: but this ſeems only to be in one particular caſe, viz. when water is thrown upon melted copper; which cannot poſſibly take place in the bowels of the earth. In other caſes water explodes with much leſs violence; and, when thrown upon melted glaſs, does not explode at all. The very violent effects of water when thrown upon copper in fuſion, therefore, moſt probably are to be attributed to a decompoſition of the water, one part of it being united to the calx of the metal, and the other ſuddenly converted into an aerial vapour; the inſtantaneous production and rarefaction of which ſeems in moſt caſes to be the cauſe of exploſion*. The ſimple preſſure of ſteam, and the burſting of a veſſel by it when long continued, cannot at all be introduced as a parallel caſe, nor are the effects in any degree ſimilar; becauſe we cannot imagine ſolid metallic veſſels in the bowels of the earth to confine the ſteam till it acquired ſuch ſtrength. At all events the ſteam muſt have penetrated the looſe earth, which it could not fail to meet with in many places, looſened it, and condenſed itſelf; and if any perſon will cover a ſteam engine with ſtones and rubbiſh inſtead of a cloſe lid, he will certainly find this to be the caſe.

102 Of the uſes of earthquakes.

103 They cannot be the means of raiſing mountains.

104 Are probably accidental circumſtances, by which greater evils are prevented.

The only power with which we are acquainted, and which is capable of producing earthquakes, then, being that of the electrical fluid, it only remains to conſider what uſes they may be thought to anſwer in the ſyſtem of nature. As they are the effects of the very higheſt natural power, it cannot be ſuppoſed that they are produced merely for the purpoſes of deſtruction; and, on the other hand, as they certainly do a great deal of miſchief, it ſeems as difficult to aſſign any benevolent purpoſe they can anſwer. It is very generally ſuppoſed, indeed, that earthquakes are the means by which Nature raiſes mountains and land from the bottom of the ſea; but this can never be admitted. We have many inſtances of mountains being ſwallowed up and loſt by earthquakes, but not a ſingle well atteſted one of a mountain being raiſed by them; and even when volcanoes are taken into the account, by which ſome mountains and iſlands have certainly been raiſed, the balance appears againſt them, and more land ſeems to have been ſunk by them than ever was raiſed*. It ſeems moſt probable therefore that earthquakes are accidental, and that the miſchief they do is only to prevent a greater evil. This we ſee takes place throughout the whole ſyſtem of nature. Thunder and lightning, violent rains, ſtorms of wind, &c. are all productive of much damage on certain occaſions; but we by no means ſuppoſe theſe phenomena to take place merely for deſtruction; and therefore we name ſuch effects *accidents*. To the ſame account, though on a larger ſcale, muſt we place earthquakes; and it only now remains to conſider what are the diſaſters ſtill more terrible than earthquakes which we ſhould have occaſion to dread, did they not interpoſe to prevent them.

Theſe evils are naturally to be dreaded from any general commotion of the electric fluid diſperſed thro' the whole globe of earth. That it does pervade it to the centre, is what we can have no reaſon to doubt; but in the internal parts it ſeems to lie dormant, or to be employed in operations which never manifeſt themſelves to us. Towards the ſurface it is manifeſtly ſet in motion by the light of the ſun; which, as proved under the article ELECTRICITY, and in various other parts of this work, is the very ſame fluid. This pro-

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* See n°77.

* See *Exploſion*.

* See *Volcano*.

105 A conſtant current of electric matter from the equator to the poles.

duces a conſtant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts abſorb more of the light than thoſe farther ſouth or north, it muſt naturally be driven out in the northern and ſouthern regions in proportion to the quantity abſorbed at the equator. In what manner earthquakes are then produced by it, has already been explained at length. They are the ſhocks occaſioned by its paſſing in great quantity from one place where it is preſſed and confined, to another from which it has a free paſſage; or from a part of the earth poſitively electrified, to one that is negatively ſo.

106 Dreadful conſequences of an univerſal commotion in the electric fluid.

Let us ſuppoſe, however, that ſuch obſtructions are thrown in its way, that it cannot get out of the earth by any paſſage. The conſequence of this muſt very ſoon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of conſequences much more terrible than any we can conceive. We ſee that by ſetting it in motion in a ſmall part of the atmoſphere or of the earth, the moſt violent effects enſue; but ſhould this tremendous fluid be obliged to *put forth all its ſtrength*, the earth muſt be ſhaken from the centre. Inſtead of plantations and little hills removed from their places, as in Calabria, it is more than probable that the largeſt iſlands and continents would be detached from their baſes, or perhaps an univerſal diſſolution enſue.

107 Why this can never take place.

Happily, however, ſuch an effect never can take place, becauſe the electric matter always vents itſelf by the ſuperficial parts; for the depths to which even the cauſes of earthquakes and volcanoes deſcend, are undoubtedly ſuperficial in compariſon of the vaſt thickneſs of the body of the earth itſelf. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the ſurface, any more than the water at the bottom of the ocean is moved by the ſtorms which ruffle the upper part.

108 Progreſs of the electric matter diſcernible after the earthquake in Calabria.

In the earthquakes in Calabria, the progreſs of the electric matter northward might be traced both thro' the bowels of the earth and through the atmoſphere. The great ſhocks happened in the month of February, but continued more or leſs through the whole ſummer. It was obſerved that Stromboli ſmoked leſs than uſual, and no particular eruption happened either of Ætna or Veſuvius. This ſhowed that the electric matter was going ſomewhere elſe; nor was it long of diſcovering the courſe it had taken.

109 Occaſions violent eruptions of fire in Greenland and Iceland.

In the beginning of ſummer a violent volcanic eruption took place in Greenland; its extent and power, however, were not known; but in the beginning of June a volcanic earthquake commenced in Iceland, and continued for eleven days without intermiſſion. This was followed by the moſt extraordinary effuſion of lava recorded in hiſtory, which continued till the 12th of Auguſt.

110 Violent thunder-ſtorms throughout all Europe.

All this time there were violent and numerous thunder ſtorms, firſt in the ſouthern and then in the more northerly parts of Europe; the air was covered with a never-ceaſing haze, not of a moiſt nature, as our author in the *Journal de Phyſique* ſuppoſes, and which he abſurdly ſays *dried* the grapes in Burgundy, but plainly of ſome other kind, and which prevented the light of the ſun from having its uſual effect.

111 Appears in the great meteor of 1783.

Six days after the immenſe volcanic eruption in Iceland had ceaſed, the great meteor made its appearance, which no doubt was the very ſame quantity of electric matter that had raiſed ſuch horrid commotions in the earth and atmoſphere, returning thro' the higher ſpaces to the ſouth from whence it had originally proceeded.

112 Why earthquakes do not happen in the time of thunder ſtorms.

Before we diſmiſs this article, it may ſtill be neceſſary to obviate an objection which may be raiſed from what is ſaid under the article LIGHTNING. It is there ſhown, that in the time of a thunder ſtorm, the parts of the earth which lie directly under the cloud are divided for ſome ſpace downward into alternate zones poſitively and negatively electrified; that the lightning from the cloud ſtrikes not the uppermoſt ſtratum directly, but only as it is impoſſible to avoid it, becauſe it lies betwixt the cloud and the zone by which the electric matter is attracted. It may then be aſked, Why an earthquake is not produced by the diſcharge of theſe two oppoſite electricities into one another directly, without the production of any thunder? Here, however, we muſt obſerve, that the electricity is originally accumulated in the atmoſphere, where the vapours ſerve as conductors, and the ſurrounding air and upper ſurface of the earth being electrified the ſame way, prevent the electric matter from ſilently diſcharging itſelf, by inſulating the clouds in the ſame manner that the conductor of a machine is inſulated by the electric ſubſtance on which it ſtands. The flaſh of lightning muſt therefore burſt out from theſe conductors in the very ſame manner that a ſpark proceeds from the prime conductor of an electrical machine, rather than from the globe or atmoſphere next to it, though both of them are undoubtedly very highly electrified at the time the machine is ſet in motion. At the ſame time it muſt be conſidered, that this continual flaſhing of the atmoſpherical electricity towards the earth, prevents any very high degree of it from accumulating in either of the terreſtrial zones already mentioned, ſo as to produce any diſcharge between them, which would indeed produce a ſhock of an earthquake.

113 Of electrical exploſions proceeding from the earth.

From an unhappy accident which happened in 1785, related by Mr Brydone in the Phil. Tranſ. for that year, we learn, that though in a thunder ſtorm the atmoſpherical electricity and that of the earth are the ſame, yet at ſome diſtance there is a difference betwixt them, and diſcharges are made from the one to the other.

114 A fatal accident by one of them accounted for.

The accident alluded to was the deſtruction of a man and two horſes by an electrical exploſion from the earth in the time of a thunder ſtorm. At the place where the exploſion happened, there was an interval of 25 or 30 ſeconds betwixt the flaſh and the clap of thunder, ſo that it muſt have been at the diſtance of between five and ſix miles; the great exploſion ſuddenly burſt out from the ſpot over which the cart-wheels paſſed to which the horſes were yoked, partially melted the iron of the wheels, killed the man who ſat on the fore-part of the cart, and tore his clothes almoſt to pieces. Two circular holes of about 20 inches diameter were made in the ground, and the earth and ſtones ſcattered about; but no fire was perceived. About an hour before the exploſion, ſome fiſhermen were caught in a violent whirlwind, which felt hot and ſultry. A lamb was killed by another exploſion about a quarter of an hour before the great one, and a woman received a violent ſtroke on the foot without being able to tell whence it proceeded. At the time the lamb was killed, the ſhepherd ſaid he felt a ſenſation as if fire had paſſed over his face.

115 Earthquake cannot happen where there is a difference betwixt the electricity of the atmoſphere and that of the earth.

By theſe exploſions, particularly the great one, the equilibrium of electricity in the atmoſphere was inſtantly reſtored, and the clouds forthwith began to ſeparate. The reaſon of this is explained under the article Lightning; here it is ſufficient to obſerve, that where there is a difference between the electricity of the atmoſphere and that of the earth, an earthquake cannot happen. Thoſe electrical exploſions experimentally demonſtrate the truth of what is argued from the principles of electricity, n° 82, *viz.* that juſt before an earthquake there is a perfect equilibrium between the electricity of the atmoſphere and that of the ſurface of the earth. When this equilibrium is broken, the earth diſcharges its ſuperfluous quantity either ſilently, by means of trees, graſs, &c. or ſometimes by exploſions in different places; but as there is no general conductor, there cannot be any general diſcharge of the whole at once. The ſingular caſe of the great diſcharge in 1785 was owing only to the accidental preſence of a good conductor, *viz.* the iron of the cart-wheels paſſing over the ſpot where the electric matter happened to be collected in great quantity. Had not this taken place, it is poſſible that a fire-ball might have riſen from the earth; for the exploſion produced effects extremely ſimilar to thoſe of the burſting of fire-balls*: but ſtill this could have no effect in producing any ſhock of an earthquake; becauſe the latter would have required a general diſcharge betwixt two great ſtrata of earth, where there cannot be any conductor to make partial ones.

116 Conical hollows in the earth obſerved by Sir William Hamilton accounted for.

In the time of earthquakes, however, there are undoubtedly many ſuch electrical diſcharges from the earth as thoſe juſt mentioned; and they are moſt probably the cauſe of thoſe conical hollows obſerved by Sir William Hamilton. When water is abundant in any part of the earth, it ſerves as a conductor for ſome quantity of the electricity, and that fluid is violently thrown out into the air: but where there is a deficiency of water, the fire breaks forth in its proper form with loud exploſions, as was obſerved; as well as the water ſpouts in Calabria in the year 1783. That year alſo the quantity of electric matter diſcharged by the earth into the air was manifeſt by the vaſt number of thunder ſtorms which immediately followed them. No fire was obſerved at the time of the exploſion which put an end to the thunder-ſtorm above mentioned; but this muſt have ariſen partly from its happening in the day-time, and partly from the electric matter having ſo many conductors to ſpend its force upon.

117 Ultimate cauſe of all the phenomena.

Having thus explained all the phenomena attending earthquakes, it remains only to ſhow by what means the equilibrium of electricity can be broken in the bowels of the earth in ſuch a manner as to produce theſe phenomena. The ultimate cauſe of this is mentioned under the article Aurora Borealis, n° 5. It is there ſhown, that the warmth of the ſun muſt neceſſarily bring down to the earth much greater quantities of electric matter in the regions within the tropics than in the northern and ſouthern climates. It is impoſſible, as is there alſo obſerved, that there can be a perpetual accumulation of electricity in one part of the earth, unleſs there is a paſſage for it into the atmoſphere through ſome other. Hence, if the electric matter deſcends from the air into one place of the earth, it muſt neceſſarily aſcend from the earth into the air in ſome other place. There muſt be therefore a continual current of electricity through the bowels of the earth, beginning at the equator, and extending northward and ſouthward to both poles. While this current has a free paſſage from the earth in the northern and ſouthern regions, every thing goes on quietly; and whatever ſtorms may happen in the atmoſphere, the ſolid earth cannot be affected. Innumerable circumſtances, however, may tend to hinder this diſcharge, and conſequently to accumulate the electric matter in particular places. One very obvious cauſe of this kind, is an exceſſive froſt taking place in any part of the earth whence the electric matter was wont to be diſcharged. This renders the air itſelf ſo electric, that it cannot receive the fluid; at the ſame time that the water on the ſurface of the earth, being hard frozen, becomes electric alſo, and incapable of conducting. Very dry ſeaſons likewiſe contribute to produce the ſame effect; and thus the accumulation of electricity in the warmer climates becomes prodigiouſly great. Hence perhaps we have ſome reaſon to conclude, that the exceſſive cold which prevailed over all Europe in 1782 was a principal cauſe of the earthquakes in 1783.

It muſt, however, be obſerved, that with regard to the operations of nature we cannot always reaſon analogically from our electric experiments. If a quantity of electricity is collected in any ſubſtance by artificial means, that quantity is taken off in a moment by the touch of any metallic ſubſtance or other good conductor. As the whole earth, therefore, is filled with a conducting ſubſtance, namely water, it may very naturally be aſked, Why does not the ſuperfluous quantity of electric matter collected in one place, immediately diſperſe itſelf through all other parts of the earth by means of the water with which it abounds?—To obviate this difficulty, however, it needs only be remembered, that as the earth is quite full of electric matter all round, no quantity can enter any particular part without being reſiſted by the reſt which is diffuſed through the whole globe. This reſiſtance will be proportioned to the facility with which it can eſcape at other places; and this it never can do, unleſs the earth is in a proper condition for emitting, and the atmoſphere for receiving, it. The preſſure, therefore, upon the accumulated quantity of electric matter ſoon becomes exceedingly great, and its diſpoſition to burſt out with violence is every day increaſed. At laſt, as the ſun ſtill continues to occaſion the deſcent of more and more of the electric fluid, that particular part of the earth becomes fully charged. The conſequence of this is, that the waters of fountains become foul; the electric matter being lodged in great quantity in the water, forces it into unuſual agitations, by which the earth is mixed with it. The ocean, for the ſame reaſon, is raiſed in huge billows, &c.; and theſe appearances prognoſticate the ſhock, in the ſame manner that ſlight flaſhes from the knob of an electrified bottle prognoſticate a diſcharge of all the electricity contained in it.

Beſides the earthquakes above deſcribed, of which the cauſe ſeems to depend entirely on a collection of electric matter in the bowels of the earth, there are others frequently felt in the neighbourhood of volcanoes, which are plainly owing to the efforts of the burning matter to diſcharge itſelf. Theſe, however, are but ſlight, and ſeldom extend to any conſiderable diſtance from the burning mountain. For a particular account of them, ſee the article Volcano.

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* See *Lightning* and *Meteors*.

EASEL pieces, among painters, ſuch ſmaller pieces, either portraits or landſcapes, as are painted on the eaſel, *i. e.* the frame whereon the canvas is laid.—They are thus called, to diſtinguiſh them from larger pictures drawn on walls, cielings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or preſcription, without profit: ſuch are a way through his lands, a ſink, or the like. Theſe, in many caſes, may be claimed.

EASING, in the ſea-language, ſignifies the ſlackening a rope or the like. Thus, to eaſe the bow-line or ſheet, is to let them go ſlacker; to eaſe the helm, is to let the ſhip go more large, more before the wind, or more larboard.

EAST, one of the four cardinal points of the world; being that point of the horizon where the ſun is ſeen to riſe when in the equinoctial.

¶ The word *eaſt* is Saxon. In Italy, and throughout the Mediterranean, the eaſt wind is called the *levante:* in Greek, ανατολη and απηλιωτης, becauſe it comes from the ſide of the ſun, απ' ηλιου; in Latin, *eurus.*

EASTER, a feſtival of the Chriſtian church, obſerved in memory of our Saviour's reſurrection.

The Greeks call it *paſga*, the Latins *paſcha*, an Hebrew word ſignifying *paſſage*, applied to the Jewiſh feaſt of the paſſover. It is called *eaſter* in Engliſh, from the goddeſs Eoſtre, worſhipped by the Saxons with peculiar ceremonies in the month of April.

The Aſiatic churches kept their eaſter upon the very ſame day the Jews obſerved their paſſover, and others on the firſt Sunday after the firſt full-moon in the new year. This controverſy was determined in the council of Nice; when it was ordained that eaſter ſhould be kept upon one and the ſame day, which ſhould always be a Sunday, in all Chriſtian churches in the world. For the method of finding eaſter by calculation, ſee Chronology, n° 31.

Easter Iſland, an iſland in the South Sea, lying in N. Lat. 27. 5. W. Long. 109. 46. It is thought to have been firſt diſcovered in 1686 by one Davis an Engliſhman, who called it *Davis's Land.* It was next viſited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of *Eaſter Iſland*, and publiſhed many fabulous accounts concerning the country and its inhabitants. It was alſo viſited by a Spaniſh ſhip in 1770, the captain of which gave it the name of *St Carlos.* The only authentic accounts of this iſland, however, which have yet appeared, are thoſe publiſhed by Captain Cook and Mr Forſter, who viſited it in the month of March 1774.—According to theſe accounts, the iſland is about 10 or 12 leagues in circumference, and of a triangular figure; its greateſt length from north-weſt to ſouth-eaſt is about four leagues, and its greateſt breadth two. The hills are ſo high, that they may be ſeen at the diſtance of 15 or 16 leagues. The north and eaſt points of the iſland are of a conſiderable height; between them, on the ſouth-eaſt ſide, the ſhore forms an open bay, in which Captain Cook thinks the Dutch anchored in 1722. He himſelf anchored on the weſt ſide of the iſland, three miles northward from the ſouth point. This, he ſays, is a good road with eaſterly winds; but a dangerous one when the wind blows from the contrary quarter, as the other on the ſouth-eaſt ſide muſt be with eaſterly winds: ſo that there is no good accommodation to be had for ſhipping round the whole iſland.

The iſland itſelf is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. As they approached the ſouth point, Mr Forſter informs us, that they obſerved the ſhore to riſe perpendicularly. It conſiſted of broken rocks, whoſe cavernous appearance, and black or ferruginous colour, ſeemed to indicate that they had been thrown up by ſubterraneous fire. Two detached rocks lie about a quarter of a mile off this point: one of them is ſingular on account of its ſhape, and repreſents a huge column or obeliſk; and both theſe rocks were inhabited by multitudes of ſea-fowls. On landing and walking into the country, they found the ground covered with rocks and ſtones of all ſizes, which appeared to have been expoſed to a great fire, where they ſeemed to have acquired a black colour and porous texture. Two or three ſhrivelled ſpecies of graſſes grew among theſe ſtones, and in ſome meaſure ſoftened the deſolate appearance of the country. The farther they advanced, the more ruinous the face of the country ſeemed to be. The roads were intolerably rugged, and filled with heaps of volcanic ſtones, among which the Europeans could not make their way but with the greateſt difficulty; but the natives leaped from one ſtone to another with ſurpriſing agility and eaſe. As they went northward along the iſland, they found the ground ſtill of the ſame nature; till at laſt they met with a large rock of black melted lava, which ſeemed to contain ſome iron, and on which was neither ſoil nor graſs, nor any mark of vegetation. Notwithſtanding this general barrenneſs, however, there are ſeveral large tracts covered with cultivated ſoil, which produces potatoes of a gold yellow colour, as ſweet as carrots, plantains, and ſugar-canes. The ſoil is a dry hard clay; and the inhabitants uſe the graſs which grows between the ſtones in other parts of the iſland as a manure, and for preſerving their vegetables when young from the heat of the ſun.

The moſt remarkable curioſity belonging to this iſland is a number of Coloſſian ſtatues; of which, however, very few remain entire. Theſe ſtatues are placed only on the ſea-coaſt. On the eaſt ſide of the iſland were ſeen the ruins of three platforms of ſtone-work, on each of which had ſtood four of theſe large ſtatues; but they were all fallen down from two of them, and one from the third: they were broken or defaced by the fall. Mr Wales meaſured one that had fallen, which was 15 feet in length, and ſix broad over the ſhoulders: each ſtatue had on its head a large cylindric ſtone of a red colour, wrought perfectly round. Others were found that meaſured near 27 feet, and upwards of eight feet over the ſhoulders; and a ſtill larger one was ſeen ſtanding, the ſhade of which was ſufficient to ſhelter all the party, conſiſting of near 30 perſons, from the rays of the ſun. The workmanſhip is rude, but not bad, nor are the features of the face ill formed; the ears are long, according to the diſtortion practiſed in the country, and the bodies have hardly any thing of a human figure about them. How theſe iſlanders, wholly unacquainted with any mechanical power, could raiſe ſuch ſtupendous figures, and afterwards place the large cylindric ſtones upon their heads, is truly wonderful! The moſt probable conjecture ſeems to be, that the ſtone is factitious; and that each figure was gradually erected, by forming a temporary platform round it, and raiſing it as the work advanced: but they are at any rate very ſtrong proofs of the ingenuity and perſeverance of the iſlanders in the age when they were built, as well as that the anceſtors of the preſent race had ſeen better days than their deſcendants enjoy. The water of this iſland is in general brackiſh, there being only one well that is perfectly freſh, which is at the eaſt end of the iſland: and whenever the natives repair to it to ſlake their thirſt, they waſh themſelves all over; and if there is a large company, the firſt leaps into the middle of the hole, drinks, and waſhes himſelf without ceremony; after which another takes his place, and ſo on in ſucceſſion. This cuſtom was much diſreliſhed by their new friends, who ſtood greatly in need of this valuable article, and did not wiſh to have it contaminated by ſuch ablutions.

The people are of a middle ſize. In general they are rather thin; go entirely naked; and have punctures on their bodies, a cuſtom common to all the inhabitants of the South Sea iſlands. Their greateſt ſingularity is the ſize of their ears, the lobe of which is ſtretched out ſo that it almoſt reſts on their ſhoulder; and is pierced with a very large hole, capable of admitting four or five fingers with eaſe. The chief ornaments for their ears are the white down of feathers and rings which they wear in the inſide of the hole, made of the leaf of the ſugar-cane, which is very elaſtic, and for this purpoſe is rolled up like a watch-ſpring. Some were ſeen clothed in the ſame cloth uſed in the iſland of Otaheite, tinged of a bright orange-colour with turmeric; and theſe our voyagers ſuppoſed to be chiefs. Their colour is a cheſnut-brown; their hair black, curling, and remarkably ſtrong; and that on the head as well as the face is cut ſhort. The women are ſmall, and ſlender-limbed: they have punctures on the face, reſembling the patches ſometimes uſed by European ladies; they paint their face all over with a reddiſh brown ruddle, and above this they lay a fine orange-colour extracted from turmeric-root; the whole is then variegated with ſtreaks of white ſhell-lime. But the moſt ſurpriſing circumſtance of all with regard to theſe people, is the apparent ſcarcity of women among them. The niceſt calculation that could be made, never brought the number of inhabitants in this iſland to above 700, and of theſe the females bore no proportion in number to the males. Either they have but few females, or elſe their women were reſtrained from appearing during the ſtay of the ſhip; notwithſtanding, the men ſhowed no ſigns of a jealous diſpoſition, or the women any ſcruples of appearing in public: in fact, they ſeemed to be neither reſerved nor chaſte; and the large pointed cap which they wore gave them the appearance of profeſſed wantons. But as all the women who were ſeen were liberal of their favours, it is more than probable that all the married and modeſt ones had concealed themſelves from their impetuous viſitants in ſome inſcrutable parts of the iſland; and what further ſtrengthens this ſuppoſition is, that heaps of ſtones were ſeen piled up into little hillocks, which had one ſteep perpendicular ſide, where a hole went under ground. The ſpace within, ſays Mr Forſter, could be but ſmall; and yet it is probable that theſe cavities ſerved, together with their miſerable huts, to give ſhelter to the people at night; and they may communicate with natural caverns, which are very common in the lava currents of volcanic countries. The few women that appeared were the moſt laſcivious of their ſex that perhaps have been ever noticed in any country, and ſhame ſeemed to be entirely unknown to them.

EATON, a town of Buckinghamſhire, ſituated on the north ſide of the Thames, oppoſite to Windſor, and famous for its collegiate ſchool, founded by King Henry VI. being a ſeminary for King's College, Cambridge, the fellows of which are all from this ſchool.

EAU DE CARMES. See PHARMACY.

Eau de Luce. See CHEMISTRY, n° 1037.

EAVES, in architecture, the margin or edge of the roof of an houſe; being the loweſt tiles, ſlates, or the like, that hang over the walls, to throw off water to a diſtance from the wall.

Eaves-Droppers, are ſuch perſons as ſtand under the eaves, or walls, and windows of a houſe, by night or day, to hearken after news, and carry it to others, and thereby cauſe ſtrife and contention in the neighbourhood. They are called *evil members of the commonwealth* by the ſtat. of Weſt. 1. c. 33. They may be puniſhed either in the court-leet by way of preſentment and fine, or in the quarter-ſeſſions by indictment and binding to good behaviour.

EBBING OF THE TIDES. See TIDE.

EBDOMARIUS, in eccleſiaſtical writers, an officer formerly appointed weekly to ſuperintend the performance of divine ſervice in cathedrals, and preſcribe the duties of each perſon attending in the choir, as to reading ſinging, praying, &c. To this purpoſe the ebdomary, at the beginning of his week, drew up in form a bill or writing of the reſpective perſons, and their ſeveral offices, called *tabula*, and the perſons there entered were ſtyled *intabulati*.

EBDOME, 'Εβδομη, in antiquity, a feſtival kept on the ſeventh of every lunar month, in honour of Apollo, to whom all ſeventh days were ſacred, becauſe one of them was his birth-day; whence he was ſometimes called *Ebdomagenes*. For the ceremonies of this ſolemnity ſee *Potter's Archæol. Græc.* lib. ii. cap. 20.

EBENUS, the EBONY TREE: A genus of the decandria order, belonging to the diadelphia claſs of plants: and in the natural method ranking under the 32d order, *Papilionaceæ*. The ſegments of the calyx are the length of the corolla, and the latter has ſcarce any alæ: there is one rough ſeed. There is but one ſpecies, the cretica, a native of the iſland of Crete, and ſome others in the Archipelago. It riſes with a ſhrubby ſtalk three or four feet high; which puts out ſeveral ſide-branches garniſhed with hoary leaves at each joint, compoſed of five narrow ſpear-ſhaped lobes, which join at their tails to the footſtalk, and ſpread out like the fingers of a hand. The branches are terminated by thick ſpikes of large purple flowers, which are of the butterfly or pea-bloom kind. The plants may be propagated from ſeeds ſown in the autumn. In this country the plants muſt be protected during the winter, as they are unable to bear the cold.

EBION, the author of the hereſy of the Ebionites, was a diſciple of Cerinthus, and his ſucceſſor. He improved upon the errors of his maſter, and added to them new opinions of his own. He began his preaching in Judea: he taught in Aſia, and even at Rome. His tenets infected the iſle of Cyprus. St John oppoſed both Cerinthus and Ebion in Aſia; and it is thought, that this apoſtle wrote his goſpel, in the year 97, particularly againſt this hereſy.

EBIONITES, ancient heretics, who roſe in the church in the very firſt age thereof, and formed themſelves into a ſect in the ſecond century, denying the divinity of Jeſus Chriſt.

Origen takes them to have been ſo called from the Hebrew word *ebion*, which in that language ſignifies *poor;* becauſe, ſays he, they were poor in ſenſe, and wanted underſtanding. Euſebius, with a view to the ſame etymology, is of opinion they were thus called, as having poor thoughts of Jeſus Chriſt, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Chriſtians in general out of contempt; becauſe in the firſt times there were few but poor people that embraced the Chriſtian religion. This opinion Origen himſelf ſeems to give into, in his book againſt Celſus, where he ſays, that they called *Ebionites*, ſuch among the Jews as believed that Jeſus was truly the expected Meſſiah.

It might even be urged, with ſome probability, that the primitive Chriſtians aſſumed the name themſelves, in conformity to their profeſſion. It is certain, Epiphanius obſerves, they valued themſelves on being poor, in imitation of the apoſtles. The ſame Epiphanius, however, is of opinion, that there had been a man of the name Ebion, the chief and founder of the ſect of Ebionites, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have riſen after the deſtruction of Jeruſalem, when the firſt Chriſtians, called *Nazarenes*, went out of the ſame to live at Pella.

The Ebionites are little elſe than a branch of Nazarenes; only that they altered and corrupted, in many things, the purity of the faith held among thoſe firſt adherents to Chriſtianity. For this reaſon, Origen diſtinguiſhes two kinds of Ebionites, in his anſwer to Celſus: the one believed that Jeſus Chriſt was born of a virgin; and the other, that he was born after the manner of other men.

The firſt were orthodox in every thing, except that to the Chriſtian doctrine they joined the ceremonies of the Jewiſh law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Phariſees. They differed from the Nazarenes, however, in ſeveral things, chiefly as to what regards the authority of the ſacred writings; for the Nazarenes received all for ſcripture contained in the Jewiſh canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Iſaiah, Jeremiah, and Ezekiel, in abhorrence. They alſo rejected all St Paul's epiſtles, whom they treated with the utmoſt diſreſpect.

They received nothing of the Old Teſtament but the Pentateuch; which ſhould intimate them to have deſcended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in uſing the Hebrew goſpels of St Matthew, otherwiſe called the Goſpel of the Twelve Apoſtles; but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour, which was preſerved entire in that of the Nazarenes, and even in thoſe uſed by the Corinthians.

Some, however, have made this goſpel canonical, and of greater value than our preſent Greek goſpel of St Matthew: See Nazarenes. Theſe laſt, whoſe ſentiments, as to the birth of our Saviour, were the ſame with thoſe of the Ebionites, built their error on this very genealogy.

Beſide the Hebrew goſpel of St Matthew, the Ebionites had adopted ſeveral other books, under the names of St James, John, and the other apoſtles: they alſo made uſe of the Travels of St Peter, which are ſuppoſed to have been written by St Clement; but had altered them ſo, that there was ſcarce any thing of truth left in them. They even made that ſaint tell a number of falſehoods, the better to authoriſe their own practices. See St Epiphanius, who is very diffuſive on the ancient hereſy of the Ebionites, *Hær.* 30. But his account deſerves little credit, as, by his own confeſſion, he has confounded the other ſects with the Ebionites, and has charged them with errors to which the firſt adherents of this ſect were utter ſtrangers.

EBONY of Crete. See Ebenus.

Ebony Wood is brought from the Indies, exceedingly hard and heavy, ſuſceptible of a very fine poliſh, and on that account uſed in moſaic and inlaid works, toys, &c. There are divers kinds of ebony: the moſt uſual among us are black, red, and green, all of them the product of the iſland of Madagaſcar, where the natives call them indifferently *bazon maintbi*, q. d. *black wood*. The iſland of St Maurice, belonging to the Dutch, likewiſe furniſhes part of the ebonies uſed in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By ſome of their deſcriptions, it ſhould be a ſort of palm-tree; by others, a cytiſus, &c. The moſt authentic of them is that of M. Flacourt, who reſided many years in Madagaſcar as governor thereof; he aſſures us, that it grows very high and big, its bark being black, and its leaves reſembling thoſe of our myrtle, of a deep, duſky, green colour.

Tavernier aſſures us, that the iſlanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their ſplitting when wrought. F. Plumier mentions another black ebony-tree, diſcovered by him at St Domingo, which he calls *ſpartium portulacæ foliis aculeatum ebeni materiæ*. Candia alſo bears a little ſhrub, known to the botaniſts under the name of *Ebenus Cretica*, above deſcribed.

Pliny and Dioſcorides ſay the beſt ebony comes from Ethiopia, and the worſt from India; but Theophraſtus prefers that of India. Black ebony is much preferred to that of other colours. The beſt is a jet black, free of veins and rind, very maſſive, aſtringent, and of an acrid pungent taſte. Its rind, infuſed in water, is ſaid to purge pituita, and cure venereal diſorders; whence Matthiolus took guaiacum for a ſort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed againſt a ſtone, it becomes brown. The Indians make ſtatues of their gods, and ſceptres for their princes, of this wood. It was firſt brought to Rome by Pompey, after he ſubdued Mithridates. It is now much leſs uſed among us than anciently; ſince the diſcovery of ſo many ways of giving other hard woods a black colour.

As to the green ebony, beſides Madagaſcar and St Maurice, it likewiſe grows in the Antilles, and eſpecially in the iſle of Tobago. The tree that yields it is very buſhy; its leaves are ſmooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, tho' ſometimes ſtreaked with yellow veins. Its uſe is not confined to moſaic work: it is likewiſe good in dyeing, as yielding a fine green tincture. As to red ebony, called alſo *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree and other woods paſs for ebony, by giving them the black colour thereof. This ſome do by a few waſhes of a hot decoction of galls; and when dry, adding writing ink thereon, and poliſhing it with a ſtiff bruſh, and a little hot wax; and others heat or burn their wood black. See Dyeing.

EBORACUM (anc. geog.), a famous city of the Brigantes in Britain, the reſidence of Septimius Severus and Conſtantius Chlorus, and where they both died; a Roman colony; and the ſtation of the Legio Sexta Victrix. Now *York*. W. Long. 50. Lat. 54. *Caer-frock*, or *Caer-effroc*, in Britiſh (Camden).

EBRO, anciently Iberus, a large river of Spain, which, taking its riſe in Old Caſtile, runs thro' Biſcay and Arragon, paſſes by Saragoſa, and, continuing its courſe thro' Catalonia, diſcharges itſelf with great rapidity into the Mediterranean, about 20 miles below the city of Tortoſa.

EBUDÆ, or Hebudes (anc. geog.), iſlands on the weſt of Scotland. The ancients differ greatly as to their ſituation, number, and names; ſaid in general to lie to the north of Ireland and weſt of Scotland. Now called the *Weſtern Iſles*, alſo *Hebrides;* this laſt a modern name, the reaſon of which does not appear, unleſs it be a corruption of *Hebudes*. By Beda called *Mevaniæ*, an appellation equally obſcure.

EBULLITION, the ſame with Boiling. The word is alſo uſed in a ſynonymous ſenſe with Effervescence.

EBUSUS (anc. geog.), the greater of the two iſlands called Pityuſæ, in the Mediterranean, near the eaſt coaſt of Spain, to the ſouth-weſt of Majorca. Famous for its paſtures for cattle, and for its figs. Now *Ivica*, 100 miles in compaſs, without any noxious animals but rabbits, who often deſtroy the corn.

ECALESIA, Εκαλυσια, in antiquity, a feſtival kept in honour of Jupiter, ſurnamed *Hecalus*, or *Hecaleſius*, from *Hecale*, one of the borough-towns in Attica.

ECASTOR, in antiquity, an oath wherein Caſtor was invoked. It was a cuſtom for the men never to ſwear by Caſtor, nor the women by Pollux.

ECATÆA, Εκαταια, in antiquity, ſtatues erected to the goddeſs Hecate, for whom the Athenians had a great veneration, believing that ſhe was the overſeer of their families, and that ſhe protected their children.

ECATESIA, Εκατησια, in antiquity, an anniverſary ſolemnity, obſerved by the Stratonicenſians, in honour of Hecate. The Athenians likewiſe had a public entertainment or ſupper every new moon, in honour of the ſame goddeſs. The ſupper was provided at the charge of the richer ſort; and was no ſooner brought to the accuſtomed place but the poor people carried all off, giving out that Hecate had devoured it. For the reſt of the ceremonies obſerved on this occaſion, ſee *Pott. Arch. Græc.* lib. ii. cap. 20.

ECATOMBÆON, Εκατομβαιων, in chronology, the firſt month of the Athenian year. It conſiſted of 30 days, and began on the firſt new moon after the ſummer ſolſtice, and conſequently anſwered to the latter part of our June and beginning of July. The Bœotians called it *Hippodromus*, and the Macedonians *Lous*. See Month. The word is a derivative from the Greek εκατομβη, *a hecatomb*, becauſe of the great number of hecatombs ſacrificed in it.

ECAVESSADE, in the manege, is uſed for a jerk of the caveſſon.

ECBATANA (anc. geog.), the royal reſidence and the capital of Media, built by Deioces king of the Medes, according to Herodotus: Pliny ſays, by Seleucus; but that could not be, becauſe it is mentioned by Demoſthenes It was ſituated on a gentle declivity, diſtant 12 ſtadia from Mount Orontes, and was in compaſs 150 ſtadia. Here ſtood the royal treaſury and tombs. It was an open unwalled town, but had a very ſtrong citadel, encompaſſed with ſeven walls, one within and riſing above another. The extent of the utmoſt was equal to the whole extent of Athens, according to Herodotus; the ſituation favouring this conſtruction, as being a gentle aſcent, and each wall was of a different colour.—Another *Ecbatana* of Perſia, a town of the Magi (Pliny).—A third of Syria.

ECCENTRICITY. See Excentricity.

ECCHELLENSIS (Abraham), a learned Maronite, whom the preſident le Jai employed in the edition of his Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, in order to make him his fellow-labourer in publiſhing that bible. They fell out: Gabriel complained to the parliament, and cruelly defamed his aſſociate; their quarrel made a great noiſe. The congregation *de propaganda fide* aſſociated him, 1636, with thoſe whom they employed in making an Arabic tranſlation of the ſcripture. They recalled him from Paris, and he laboured in that tranſlation at Rome in the year 1652. While he was profeſſor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to tranſlate from Arabic into Latin the 5th, 6th, and 7th books of Apollonius's Conics; in which he was aſſiſted by John Alphonſo Borelli, who added commentaries to them. He died at Rome in 1664.

ECCHYMOSIS, from εκχυω to *pour out*, or from εξ, *out of*, and χυμος *juice*. It is an effuſion of humours from their reſpective veſſels, under the teguments; or, as Paulus Ægineta ſays, "When the fleſh is bruiſed by the violent colliſion of any object, and its ſmall veins broken, the blood is gradually diſcharged from them." This blood, when collected under the ſkin, is called an *ecchymoſis*, the ſkin in the mean time remaining entire; ſometimes a tumor is formed by it, which is ſoft and livid, and generally without pain. If the quantity of blood is not conſiderable, it is uſually reſorbed; if much, it ſuppurates: it rarely happens

Ecclairciſſement || Eccleſiaſtical Courts.

that any further inconvenience follows; though, in caſe of a very bad habit of body, a mortification may be the reſult, and in ſuch a caſe regard muſt be had thereto.

ECCLAIRCISSEMENT. See Esclaircissement.

ECCLESIASTES, a canonical book of the Old Teſtament, the deſign of which is to ſhow the vanity of all ſublunary things.

It was compoſed by Solomon; who enumerates the ſeveral objects on which men place their happineſs, and then ſhows the inſufficiency of all worldly enjoyments.

The Talmudiſts made king Hezekiah to be the author of it; Grotius aſcribes it to Zorobabel, and others to Iſaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleaſures of life.

ECCLESIASTICAL, an appellation given to whatever belongs to the church: thus we ſay, eccleſiaſtical polity, juriſdiction, hiſtory, &c.

Blackſt. Comment. *Ecclesiastical Courts.* In the time of the Anglo-Saxons there was no ſort of diſtinction between the lay and the eccleſiaſtical juriſdiction: the county-court was as much a ſpiritual as a temporal tribunal: the rights of the church were aſcertained and aſſerted at the ſame time, and by the ſame judges, as the rights of the laity. For this purpoſe the biſhop of the dioceſe, and the alderman, or in his abſence the ſheriff of the county, uſed to ſit together in the county court, and had there the cognizance of all cauſes as well eccleſiaſtical as civil; a ſuperior deference being paid to the biſhop's opinion in ſpiritual matters, and to that of the lay-judges in temporal. This union of power was very advantageous to them both: the preſence of the biſhop added weight and reverence to the ſheriff's proceedings; and the authority of the ſheriff was equally uſeful to the biſhop, by enforcing obedience to his decrees in ſuch refractory offenders as would otherwiſe have deſpiſed the thunder of mere eccleſiaſtical cenſures.

But ſo moderate and rational a plan was wholly inconſiſtent with thoſe views of ambition that were then forming by the court of Rome. It ſoon became an eſtabliſhed maxim in the papal ſyſtem of policy, that all eccleſiaſtical perſons, and all eccleſiaſtical cauſes, ſhould be ſolely and entirely ſubject to eccleſiaſtical juriſdiction only: which juriſdiction was ſuppoſed to be lodged in the firſt place and immediately in the Pope, by divine indefeaſible right and inveſtiture from Chriſt himſelf, and derived from the Pope to all inferior tribunals. Hence the canon law lays it down as a rule, that "*ſacerdotes a regibus honorandi ſunt, non judicandi*; and places an emphatical reliance on a fabulous tale which it tells of the emperor Conſtantine, That when ſome petitions were brought to him, imploring the aid of his authority againſt certain of his biſhops accuſed of oppreſſion and injuſtice, he cauſed (ſays the holy canon) the petitions to be burnt in their preſence, diſmiſſing them with this valediction: "*Ite, et inter vos cauſas veſtras diſcutite, quia dignum non eſt ut nos judicemus Deos.*"

It was not, however, till after the Norman conqueſt, that this doctrine was received in England; when William I. (whoſe title was warmly eſpouſed by the monaſteries which he liberally endowed, and by the foreign clergy whom he brought over in ſhoals from France and Italy, and planted in the beſt preferments of the Engliſh church), was at length prevailed upon to eſtabliſh this fatal encroachment, and ſeparate the eccleſiaſtical court from the civil: whether actuated by principles of bigotry, or by thoſe of a more refined policy, in order to diſcountenance the laws of king Edward abounding with the ſpirit of Saxon liberty, is not altogether certain. But the latter, if not the cauſe, was undoubtedly the conſequence, of this ſeparation: for the Saxon laws were ſoon overborne by the Norman juſticiaries, when the county-court fell into diſregard by the biſhop's withdrawing his preſence, in obedience to the charter of the conqueror; which prohibited any ſpiritual cauſe from being tried in the ſecular courts, and commanded the ſuitors to appear before the biſhop only, whoſe deciſions were directed to conform to the canon law.

King Henry I. at his acceſſion, among other reſtorations of the laws of king Edward the Confeſſor, revived this of the union of the civil and eccleſiaſtical courts. Which was, according to Sir Edward Coke, after the great heat of the conqueſt was paſt, only a reſtitution of the ancient law of England. This however was ill reliſhed by the Popiſh clergy, who, under the guidance of that arrogant prelate archbiſhop Anſelm, very early diſapproved of a meaſure that put them on a level with the profane laity, and ſubjected ſpiritual men and cauſes to the inſpection of the ſecular magiſtrates: and therefore, in their ſynod at Weſtminſter, 3 Hen. I. they ordained, that no biſhop ſhould attend the diſcuſſion of temporal cauſes; which ſoon diſſolved this newly effected union. And when, upon the death of king Henry I. the uſurper Stephen was brought in and ſupported by the clergy, we find one article of the oath which they impoſed upon him was, that eccleſiaſtical perſons and eccleſiaſtical cauſes ſhould be ſubject only to the biſhop's juriſdiction. And as it was about that time that the conteſt and emulation began between the laws of England and thoſe of Rome, the temporal courts adhering to the former, and the ſpiritual adopting the latter, as their rule of proceeding; this widened the breach between them, and made a coalition afterwards impracticable; which probably would elſe have been effected at the general reformation of the church.

Eccleſiaſtical Courts are various; as the Archdeacon's, the Consistory, the Court of Arches, the Peculiars, the Prerogative, and the great court of appeal in all eccleſiaſtical cauſes, viz. the Court of Delegates. See theſe articles.

Blackſt. Comment. As to the method of proceeding in the ſpiritual courts, it muſt (in the firſt place) be acknowledged to their honour, that though they continue to this day to decide many queſtions which are properly of temporal cognizance, yet juſtice is in general ſo ably and impartially adminiſtered in thoſe tribunals (eſpecially of the ſuperior kind), and the boundaries of their power are now ſo well known and eſtabliſhed, that no material inconvenience at preſent ariſes from this juriſdiction ſtill continuing in the ancient channel. And, ſhould any alteration be attempted, great confuſion would probably ariſe, in overturning long eſtabliſhed forms, and new-modelling a courſe of proceedings that has now prevailed for ſeven centuries.

The eſtabliſhment of the civil-law proceſs in all the eccleſiaſtical courts was indeed a maſter-piece of papal diſcernment, as it made a coalition impracticable between them and the national tribunals, without manifeſt inconvenience and hazard. And this conſideration had undoubtedly its weight in cauſing this meaſure to be adopted, though many other cauſes concurred. In particular, it may be here remarked, that the pandects, or collections of civil law, being written in the Latin tongue, and referring ſo much to the will of the prince and his delegated officers of juſtice, ſufficiently recommended them to the court of Rome, excluſive of their intrinſic merit. To keep the laity in the darkeſt ignorance, and to monopolize the little ſcience which then exiſted entirely among the monkiſh clergy, were deep-rooted principles of papal policy. And as the biſhops of Rome affected in all points to mimic the imperial grandeur, as the ſpiritual prerogatives were moulded on the pattern of the temporal, ſo the canon-law proceſs was formed on the model of the civil law; the prelates embracing, with the utmoſt ardor, a method of judicial proceedings, which was carried on in a language unknown to the bulk of the people, which baniſhed the intervention of a jury (that bulwark of Gothic liberty), and which placed an arbitrary power of deciſion in the breaſt of a ſingle man.

The proceedings in the eccleſiaſtical courts are therefore regulated according to the practice of the civil and canon laws; or rather to a mixture of both, corrected and new-modelled by their own particular uſages, and the interpoſition of the courts of common law. For, if the proceedings in the ſpiritual court be ever ſo regularly conſonant to the rules of the Roman law, yet if they be manifeſtly repugnant to the fundamental maxims of the municipal laws, to which, upon principles of ſound policy, the eccleſiaſtical proceſs ought in every ſtate to conform (as if they require two witneſſes to prove a fact, where one will ſuffice at common law); in ſuch caſes, a prohibition will be awarded againſt them. But, under theſe reſtrictions, their ordinary courſe of proceeding is, firſt, by *citation*, to call the party injuring before them. Then by *libel* (*libellus*, "a little book"), or by articles drawn out in a formal *allegation*, to ſet forth the complainant's ground of complaint. To this ſucceeds the *defendant's anſwer* upon oath; when, if he denies or extenuates the charge, they proceed to *proofs* by witneſſes examined, and their depoſitions taken down in writing by an officer of the court. If the defendant has any circumſtances to offer in his defence, he muſt alſo propound them in what is called his *defenſive allegation*, to which he is intitled in his turn to the *plaintiff's anſwer* upon oath, and may from thence proceed to *proofs* as well as his antagoniſt. The canonical doctrine of *purgation*, whereby the parties were obliged to anſwer upon oath to any matter, however criminal, that might be objected againſt them (though long ago over-ruled in the court of chancery, the genius of the Engliſh law having broken through the bondage impoſed on it by its clerical chancellors, and aſſerted the doctrines of judicial as well as civil liberty), continued till the middle of the laſt century, to be upheld by the ſpiritual courts; when the legiſlature was obliged to interpoſe, to teach them a leſſon of ſimilar moderation. By the ſtatute of 13 Car. II. c. 12. it is enacted, that it ſhall not be lawful for any biſhop, or eccleſiaſtical judge, to tender or adminiſter to any perſon whatſoever, the oath uſually called the oath *ex officio*, or any other oath whereby he may be compelled to confeſs, accuſe, or purge himſelf of any criminal matter or thing, whereby he may be liable to any cenſure or puniſhment. When all the pleadings and proofs are concluded, they are referred to the conſideration, not of a jury, but of a ſingle judge; who *takes information* by hearing advocates on both ſides, and thereupon forms his *interlocutory decree* or *definitive ſentence*, at his own diſcretion: from which there generally lies an *appeal*, in the ſeveral ſtages mentioned in the articles above referred to; though if the ſame be not appealed from him in 15 days, it is final, by the ſtatute 25 Hen. VIII. c. 19.

But the point in which theſe juriſdictions are the moſt defective, is that of enforcing their ſentences when pronounced; for which they have no other proceſs but that of *excommunication;* which would be often deſpiſed by obſtinate or profligate men, did not the civil law ſtep in with its aid. See EXCOMMUNICATION.

ECCLESIASTICAL Corporations, are where the members that compoſe them are *ſpiritual* perſons. They were erected for the furtherance of religion and perpetuating the rights of the church. See CORPORATIONS.

ECCLESIASTICAL State. See CLERGY.

ECCLESIASTICUS, an apocryphal book, generally bound up with the ſcriptures, ſo called, from its being read in the church, *eccleſia*, as a book of piety and inſtruction, but not of infallible authority.

The author of this book was a Jew, called *Jeſus the ſon of Sirach*. The Greeks call it the *Wiſdom of the ſon of Sirach*.

ECCOPROTICS, in medicine, laxative or looſening remedies, which purge gently, by ſoftening the humours and excrements, and fitting them for expulſion. —The word is compoſed of the Greek particle εκ; and κοπρος *excrement*.

ECDICI, Εκδικοι, among the ancients, patrons of cities, who defended their rights, and took care of the public money. Their office reſembled that of the modern ſyndics.

ECHAPE, in the manege, a horſe begot between a ſtallion and a mare of different breeds and countries.

ECHAPER, in the manege, a galliciſm uſed in the academies implying to give a horſe head, or to put on at full ſpeed.

ECHENEIS, the REMORA, in ichthyology; a genus belonging to the order of thoracici. The head is fat, naked, depreſſed, and marked with a number of tranſverſe ridges; it has ten rays in the branchioſtege membrane; and the body is naked. There are two Plate CLXXIII. ſpecies, viz. 1. The remora, or ſucking-fiſh, with a forked tail, and 18 ſtriæ on the head. It is found in the Indian ocean. 2. The neucrates, with an undivided tail, and 16 ſtriæ on the head. It is likewiſe a native of the Indian ocean. Theſe fiſhes are often found adhering ſo ſtrongly to the ſides of ſharks and other great fiſh, by means of the ſtructure of its head, as to be got off with difficulty. This fiſh was believed, by all the ancients, to have moſt wonderful powers, and to be able, by adhering to the bottom, to arreſt the motion of a ſhip in its fulleſt courſe; and in love affairs, to deaden the warmeſt affections of both ſexes (*Plin.* lib. ix. c. 25.).

ECHEVIN, in the French and Dutch polity, a magiſtrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanlineſs of the city.

At Paris, there is a prevôt and four echevins; in other towns, a mayor and echevins. At Amſterdam, there are nine echevins; and at Rotterdam, ſeven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal cauſes; and if the criminal confeſſes himſelf guilty, they can ſee their ſentence executed without appeal.

ECHINATE, or Echinated, an appellation given to whatever is prickly, thereby reſembling the hedgehog.

ECHINITES, in natural hiſtory, the name by which authors call the foſſile centronia, frequently found in our chalk-pits. See Centronia.

ECHINOPHORA, in botany: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The male florets are lateral, with the central one hermaphrodite; there is one ſeed, ſunk into an indurated involucrum.

ECHINOPS, in botany: A genus of the polygamia ſegregatæ order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is uniflorous; the corollulæ tubulated, and hermaphrodite; the receptacle briſtly; the pappus indiſtinct.

ECHINUS, in zoology, a genus of inſects belonging to the order of vermes molluſca. The body is roundiſh, covered with a bony cruſt, and often beſet with moveable prickles; and the mouth is below, and conſiſts of five valves. 1. The eſculentus, or eatable echinus, is of a hemiſpherical form, covered with ſharp ſtrong ſpines, above half an inch long; commonly of a violet colour; moveable; adherent to ſmall tubercles elegantly diſpoſed in rows. Theſe are their inſtruments of motion by which they change their place. This ſpecies is taken in dredging, and often lodges in cavities of rocks juſt within low water mark. They are eaten by the poor in many parts of England, and by the better ſort abroad. In old times they were a favourite diſh. They were dreſſed with vinegar, honied wine or mead, parſley or mint; and thought to agree with the ſtomach. They were the firſt diſh in the famous ſupper of Lentulus, when he was made *flamen Martialis*, or prieſt of Mars. By ſome of the concomitant diſhes, they ſeem to have been deſigned as a whet for the ſecond courſe, to the holy perſonages, prieſts and veſtals invited on that occaſion. Many ſpecies of ſhell-fiſh made part of that entertainment. 2. The lacunoſus, or oval echinus, is of an oval depreſſed form; on the top it is of a purple colour, marked with a quadrefoil, and the ſpaces between tuberculated in waved rows; the lower ſide ſtudded, and divided by two ſmooth ſpaces. Length, four inches. When clothed, it is covered with ſhort thickſet briſtles mixed with very long ones. There are 15 other ſpecies, all natives of the ſea. See two ſpecimens delineated on Plate CLXXIII.

Echinus, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and Compoſite capitals.

ECHITES, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two long and ſtraight follicles; the ſeeds pappous; the corolla funnel-ſhaped, with the throat naked. The corymboſa, a ſpecies of this genus, is ſuppoſed to yield the elaſtic gum according to Jaquin. See Caoutchouc.

ECHIUM, viper's bugloss, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is irregular, with the throat naked. There are ſeven ſpecies, three of which are natives of Britain. None of them have any remarkable property, except that the flowers of one ſpecies (the vulgare) are very grateful to bees. It is a native of many parts of Britain. The ſtem is rough with hairs and tubercles. The leaves are ſpear-ſhaped, and rough with hair. The flowers come out in lateral ſpikes. They are firſt red, afterwards blue; ſometimes purple or white.—Cows and ſheep are not fond of the plant; horſes and goats refuſe it.

ECHO, or Eccho, a ſound reflected or reverberated, from a ſolid, concave, body, and ſo repeated to the ear *. The word is formed from the Greek ἠχω *ſound*, which comes from the verb ἠχεω *ſono*.

The ancients being wholly unacquainted with the true cauſe of the echo, aſcribed it to ſeveral cauſes ſufficiently whimſical. The poets, who were not the worſt of their philoſophers, imagined it to be a perſon of that name metamorphoſed, and that ſhe affected to take up her abode in particular places; for they found by experience, that ſhe was not to be met with in all. (See below, Echo in *fabulous hiſtory*.) But the moderns, who know ſound to conſiſt in a certain tremor or vibration in the ſonorous body communicated to the contiguous air, and by that means to the ear, give a more conſiſtent account of echo.

For a tremulous body, ſtriking on another ſolid body, it is evident, may be repelled without deſtroying or diminiſhing its tremor; and conſequently a ſound may be redoubled by the reſilition of the tremulous body, or air.

But a ſimple reflexion of the ſonorous air, is not enough to ſolve the echo: for then every plain ſurface of a ſolid hard body, as being fit to reflect a voice or ſound, would redouble it; which we find does not hold.

To produce an echo, therefore, it ſhould ſeem that a kind of concameration or vaulting were neceſſary, in order to collect, and by collecting to heighten and increaſe, and afterwards reflect, the ſound; as we find is the caſe in reflecting the rays of light, where a concave mirror is required.

In effect, as often as a ſound ſtrikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; ſo often will it be reverberated in the ſame line, or other adjacent ones.

For an echo to be heard, therefore, it is neceſſary the ear be in the line of reflection: for the perſon who made the ſound to hear its echo, it is neceſſary he be per-

* See *Acouſtics*, n° 23.

perpendicular to the place which reflects it: and for a manifold or tautological echo, it is neceſſary there be a number of walls, and vaults or cavities, either placed behind or fronting each other.

A ſingle arch or concavity, &c. can ſcarce ever ſtop and reflect all the ſound; but if there be a convenient diſpoſition behind it, part of the ſound propagated thither, being collected and reflected as before, will preſent another echo: or, if there be another concavity, oppoſed at a due diſtance to the former, the ſound reflected from the one upon the other will be toſſed back again by this latter, &c.

Many of the phenomena of echos are well conſidered by the biſhop of Leighs, &c. who remarks, that any ſound, falling either directly or obliquely on any denſe body of a ſmooth, whether plain or arched, ſuperficies, is reflected, or echoes, more or leſs. The ſurface, ſays he, muſt be ſmooth; otherwiſe the air, by reverberation, will be put out of its regular motion, and the ſound thereby broken and extinguiſhed. He adds, that it echoes more or leſs, to ſhow, that when all things are as before deſcribed, there is ſtill an echoing, tho' it be not always heard; either becauſe the direct ſound is too weak to beat quite back again to him that made it; or that it does return to him, but ſo weak, that it cannot be diſcerned; or that he ſtands in a wrong place to receive the reflected ſound, which paſſes over his head, under his feet, or on one ſide of him; and which therefore may be heard by a man ſtanding in the place where the reflected ſound does come, provided no interpoſed body intercepts it, but not by him that firſt made it.

Echoes may be produced with different circumſtances. For, 1. A *plane* obſtacle reflects the ſound back in its due tone and loudneſs; allowance being made for the proportionable decreaſe of the ſound, according to its diſtance.

2. A *convex* obſtacle reflects the ſound ſomewhat ſmaller and ſomewhat quicker, though weaker, than otherwiſe it would be.

3. A *concave* obſtacle echoes back the ſound, bigger, ſlower, and alſo inverted; but never according to the order of words.

Nor does it ſeem poſſible to contrive any ſingle echo, that ſhall invert the ſound, and repeat backwards; becauſe, in ſuch caſe, the word laſt ſpoken, that is, which laſt occurs to the obſtacle, muſt be repelled firſt; which cannot be. For where in the mean time ſhould the firſt words hang and be concealed; or how, after ſuch a pauſe, be revived, and animated again into motion?

From the determinate concavity or archedneſs of the reflecting bodies, it may happen that ſome of them ſhall only echo back one determinate note, and only from one place.

4. The echoing body being removed farther off, it reflects more of the ſound than when nearer; which is the reaſon why ſome echoes repeat but one ſyllable, ſome one word, and ſome many.

5. Echoing bodies may be ſo contrived and placed, as that reflecting the ſound from one to the other, either directly and mutually, or obliquely and by ſucceſſion, out of one ſound, a multiple echo or many echoes ſhall ariſe.

Add, that a multiple echo may be made, by ſo placing the echoing bodies at unequal diſtances, that they may reflect all one way, and not one on the other; by which means, a manifold ſucceſſive ſound will be heard; one clap of the hands, like many; one *ha*, like a laughter; one ſingle word, like many of the ſame tone and accent; and ſo one viol, like many of the ſame kind, imitating each other.

Laſtly, echoing bodies may be ſo ordered, that from any one ſound given, they ſhall produce many echoes different both as to tone and intention. By which means a muſical room may be ſo contrived, that not only one inſtrument playing therein ſhall ſeem many of the ſame ſort and ſize, but even a concert of different ones, only by placing certain echoing bodies ſo, that any note played ſhall be returned by them in 3ds, 5ths, and 8ths.

ECHO, is alſo uſed for the place where the repetition of the ſound is produced or heard.

Echoes are diſtinguiſhed into divers kinds, *viz.*

1. *Single*, which return the voice but once. Whereof ſome are *tonical*, which only return a voice when modulated into ſome particular muſical tone: Others, *polyſyllabical*, which return many ſyllables, words, and ſentences. Of this laſt kind is that fine echo in Woodſtock-park, which Dr Plot aſſures us, in the day-time, will return very diſtinctly ſeventeen ſyllables, and in the night twenty.

2. *Multiple*, or *tautoligical*; which return ſyllables and words the ſame oftentimes repeated.

In echoes, the place where the ſpeaker ſtands is called the *centrum phonicum*; and the object or place that returns the voice, the *centrum phonocampticum*.

At the ſepulchre of Metella, wife of Craſſus, was an echo, which repeated what a man ſaid five times. Authors mention a tower at Cyzicus, where the echo repeated ſeven times. One of the fineſt echoes we read of is that mentioned by Barthius, in his notes on Statius's *Thebais*, lib. vi. 30. which repeated the words a man uttered 17 times: it was on the banks of the Naha, between Coblentz and Bingen. Barthius aſſures us, he had proved what he writes; and had told 17 repetitions. And whereas, in common echoes, the repetition is not heard till ſome time after hearing the word ſpoke, or the notes ſung; in this, the perſon who ſpeaks or ſings is ſcarce heard at all; but the repetition moſt clearly, and always in ſurpriſing varieties; the echo ſeeming ſometimes to approach nearer, and ſometimes to be further off. Sometimes the voice is heard very diſtinctly, and ſometimes ſcarce at all. One hears only one voice, and another ſeveral: one hears the echo on the right, and the other on the left; &c. At Milan in Italy, is an echo which reiterates the report of a piſtol 56 times; and if the report is very loud, upwards of 60 reiterations may be counted. The firſt 20 echoes are pretty diſtinct; but as the noiſe ſeems to fly away, and anſwer at a greater diſtance, the reiterations are ſo doubled, that they can ſcarce be counted. See an account of a remarkable echo under the article PAISLEY.

ECHO, in architecture, a term applied to certain kinds of vaults and arches, moſt commonly of the elliptic and parabolic figures, uſed to redouble ſounds, and produce artificial echoes.

ECHO, in poetry, a kind of compoſition wherein the laſt words or ſyllables of each verſe contains ſome meaning, which, being repeated apart, anſwers to ſome queſtion or other matter contained in the verſe; as in this beautiful one from Virgil:

> *Crudelis mater magis, an puer improbus ille?*
> *Improbus ille puer, crudelis tu quoque mater.*

The elegance of an echo conſiſts in giving a new ſenſe to the laſt words; which reverberate, as it were, the motions of the mind, and by that means affect it with ſurpriſe and admiration.

Echo, in fabulous hiſtory, a daughter of the Air and Tellus, who chiefly reſided in the vicinity of the Cephiſus. She was once one of Juno's attendants, and became the confident of Jupiter's amours. Her loquacity however diſpleaſed Jupiter, and ſhe was deprived of the power of ſpeech by Juno, and only permitted to anſwer to the queſtions which were put to her. Pan had formerly been one of her admirers, but he never enjoyed her favours. Echo, after ſhe had been puniſhed by Juno, fell in love with Narciſſus; but being deſpiſed by him, pined herſelf to death, having nothing but her voice left.

ECHOMETER, among muſicians, a kind of ſcale or rule, with ſeveral lines thereon, ſerving to meaſure the duration and length of ſounds, and to find their intervals and ratios.

ECHOUERIES. See under TRICHECUS.

ECKIUS (John), an eminent and learned divine, profeſſor in the univerſity of Ingoldſtadt, memorable for the oppoſition he gave to Luther, Melancthon, Caraloſtadius, and other leading Proteſtants in Germany. He wrote many polemical tracts; and among the reſt, a *Manual of Controverſies*, printed in 1535, in which he diſcourſes upon moſt of the heads conteſted between the Proteſtants and Papiſts. He was a man of uncommon learning, parts, and zeal, and died in 1543.

ECLECTICS *(eclectici)*, a name given to ſome ancient philoſophers, who, without attaching themſelves to any particular ſect, took what they judged good, and ſolid, from each. Hence their denomination; which, in the original Greek, ſignifies, "that may be choſen," or "that chooſes;" of the verb εκλεγω *I chooſe.*—Laertius notes, that they were alſo, for the ſame reaſon, denominated *analogetici;* but that they call themſelves *Philalethes*, i. e. lovers of truth.

The chief or founder of the eclectici was one Potamon of Alexandria, who lived under Auguſtus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic ſect; which Voſſius calls the *eclective*.

Towards the cloſe of the ſecond century a ſect aroſe in the Chriſtian church under the denomination of *Eclectics*, or modern *Platonics*. They profeſſed to make truth the only object of their enquiry, and to be ready to adopt from all the different ſyſtems and ſects, ſuch tenets as they thought agreeable to it. However, they preferred Plato to the other philoſophers, and looked upon his opinions concerning God, the human ſoul, and things inviſible, as conformable to the ſpirit and genius of the Chriſtian doctrine. One of the principal patrons of this ſyſtem was Ammonius Saccas, who at this time laid the foundation of that ſect, afterwards diſtinguiſhed by the name of the new *Platonics*, in the Alexandrian ſchool. See AMMONIUS and PLATONISTS.

ECLECTICS were alſo a certain ſet of phyſicians among the ancients, of whom Archigenes, under Trajan, was the chief, who ſelected from the opinions of all the other ſects, that which appeared to them beſt and moſt rational; hence they were called *eclectics*, and their preſcriptions *medicina eclectica*.

ECLIPSE, in aſtronomy, the deprivation of the light of the ſun, or of ſome heavenly body, by the interpoſition of another heavenly body between our ſight and it. See ASTRONOMY-*Index*.

ECLIPTA, in botany; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants. The receptacle is chaffy; there is no pappus, and the corollulæ of the diſk quadrifid.

ECLIPTIC, in aſtronomy, a great circle of the ſphere, ſuppoſed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30′, which is the ſun's greateſt declination; or, more ſtrictly ſpeaking, it is that path or way among the fixed ſtars, that the earth appears to deſcribe to an eye placed in the ſun. See ASTRONOMY-*Index*.

Some call it *via Solis*, "the way of the ſun;" becauſe the ſun in his apparent annual motion never deviates from it, as all the other planets do more or leſs.

ECLIPTIC, in geography, a great circle on the terreſtrial globe, not only anſwering to, but falling within, the plane of the celeſtial ecliptic. See GEOGRAPHY.

ECLOGUE, in poetry, a kind of paſtoral compoſition, wherein ſhepherds are introduced converſing together. The word is formed from the Greek εκλογη *choice;* ſo that, according to the etymology, *eclogue* ſhould be no more than a ſelect or choice piece; but cuſtom has determined it to a farther ſignification, viz. a little elegant compoſition in a ſimple natural ſtyle and manner.

Idyllion and eclogue, in their primary intention, are the ſame thing: thus, the idyllia, ειδυλλια, of Theocritus, are pieces wrote perfectly in the ſame vein with the *eclogæ* of Virgil. But cuſtom has made a difference between them, and appropriated the name *eclogue* to pieces wherein ſhepherds are introduced ſpeaking; *idyllion*, to thoſe wrote like the eclogue, in a ſimple natural ſtyle, but without any ſhepherds in them.

ECLUSE, a ſmall but ſtrong town of the Dutch Low Countries, in the county of Flanders, with a good harbour and ſluices. The Engliſh beſieged it in vain in 1405, and the people of Bruges in 1436. But the Dutch, commanded by Count Maurice of Naſſau, took it in 1644. It is defended by ſeveral forts, and ſtands near the ſea. E. Long. 3. 10. N. Lat. 50. 25.

ECPHRACTICS, in medicine, remedies which attenuate and remove obſtructions. See ATTENUANTS, and DEOBSTRUENTS.

ECSTASY. See EXTASY.

ECSTATICI, Εκϛατικοι, from εξιϛημι *I am entranced*, in antiquity, a kind of diviners who were caſt into trances or ecſtaſies, in which they lay like dead men, or aſleep, deprived of all ſenſe and motion; but, after ſome time, returning to themſelves, gave ſtrange relations of what they had ſeen and heard.

ECTHESIS, in church-hiſtory, a confeſſion of faith, in the form of an edict, publiſhed in the year 639, by the emperor Heraclius, with a view to pacify the troubles occaſioned by the Eutychian hereſy in the eaſtern church. However, the ſame prince revoked it, on being informed that pope Severinus had condemned it, as favouring the Monothelites; declaring at the ſame time, that Sergius, patriarch of Conſtantinople, was the author of it.

ECTHLIPSIS, among Latin grammarians, a figure of proſody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the ſake of the meaſure of the verſe: thus they read *mult' ille*, or *multum ille*.

ECTROPIUM, in ſurgery, is when the eye-lids are inverted, or retracted, ſo that they ſhow their internal or red ſurface, and cannot ſufficiently cover the eye.

ECTYLOTICS, in pharmacy, remedies proper for conſuming calloſities.

ECU, or Escu, a French crown; for the value of which, ſee Money.

EDDA, in antiquities, is a ſyſtem of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philoſophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Aſia, and from whom our Saxon anceſtors were deſcended. Mr Mallet apprehends that it was originally compiled, ſoon after the Pagan religion was aboliſhed, as a courſe of poetical lectures, for the uſe of ſuch young Icelanders as devoted themſelves to the profeſſion of a *ſcald* or poet. It conſiſts of two principal parts; the *firſt* containing a brief ſyſtem of mythology, properly called the *Edda;* and the *ſecond* being a kind of art of poetry, and called *ſcalda* or *poetics*. The moſt ancient Edda was compiled by Soemund Sigfuſſon, ſurnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more eaſy and intelligible about 120 years afterwards, by Snorro Sturleſon, who was ſupreme judge of Iceland in the years 1215 and 1222; and it was publiſhed in the form of a dialogue. He added alſo the ſecond part in the form of a dialogue, being a detail of different events tranſacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund, are the Voluſpa, the Havamaal, and the Runnic chapter. The Voluſpa, or prophecy of Vola or Fola, appears to be the text, on which the Edda is the comment. It contains in two or three hundred lines the whole ſyſtem of mythology, diſcloſed in the Edda, and may be compared to the Sibylline verſes, on account of its laconic yet bold ſtyle, and its imagery and obſcurity. It is profeſſedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It deſcribes the chaos, the formation of the world, with its various inhabitants, the function of the gods, their moſt ſignal adventures, their quarrels with Loke their great adverſary, and the vengeance that enſued; and concludes with a long deſcription of the final ſtate of the univerſe, its diſſolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the puniſhment of the wicked. The Havamaal, or Sublime Diſcourſe, is attributed to the god Odin, who is ſuppoſed to have given theſe precepts of wiſdom to mankind; it is compriſed in about 120 ſtanzas, and reſembles the book of Proverbs. Mr Mallet has given ſeveral extracts of this treatiſe on the Scandinavian ethics. The Runic chapter contains a ſhort ſyſtem of ancient magic, and eſpecially of the enchantments wrought by the operation of Runic characters, of which Mr Mallet has alſo given a ſpecimen. A manuſcript copy of the Edda of Snorro is preſerved in the library of the univerſity of Upſal; the firſt part of which hath been publiſhed with a Swediſh and Latin verſion by M. Goranſon. The Latin verſion is printed as a ſuppliment to M. Mallet's Northern Antiquities. The firſt edition of the Edda was publiſhed by Reſenius, profeſſor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the Edda, a Latin tranſlation by an Icelandic prieſt, a Daniſh verſion, and various readings from different MSS. M. Mallet has alſo given an Engliſh tranſlation of the firſt part, accompanied with remarks; from which we learn, that the Edda teaches the doctrine of the Supreme, called the *Univerſal Father*, and *Odin*, who lives for ever, governs all his kingdom, and directs the great things as well as the ſmall; who formed the heaven, earth, and air; made man, and gave him a ſpirit or ſoul, which ſhall live, after the body ſhall have mouldered away; and then all the juſt ſhall dwell with him in a place *Gimle* or *Vingolf*, the palace of friendſhip; but wicked men ſhall go to Hela, or death, and from thence to Niſlheim, or the abode of the wicked, which is below in the ninth world. It inculcates alſo the belief of ſeveral inferior gods and goddeſſes, the chief of whom is Frigga or Frea, i. e. *lady*, meaning hereby the earth, who was the ſpouſe of Odin or the Supreme God; whence we may infer that, according to the opinion of theſe ancient philoſophers, this Odin was the active principle or ſoul of the world, which uniting itſelf with matter, had thereby put it into a condition to produce the intelligences or inferior gods, and men and all other creatures. The Edda likewiſe teaches the exiſtence of an evil being called *Loke*, the calumniator of the gods, the artificer of fraud, who ſurpaſſes all other beings in cunning and perfidy. It teaches the creation of all things out of an abyſs or chaos; the final deſtruction of the world by fire; the abſorption of the inferior divinities, both good and bad, into the boſom of the grand divinity, from whom all things proceeded, as emanations of his eſſence, and who will ſurvive all things; and the renovation of the earth in an improved ſtate.

EDDISH, or Eadiſh, the latter paſture or graſs that comes after mowing or reaping; otherwiſe called *eagraſs* or *earſh*, and *etch*.

EDDOES or Edders, in botany; the American name of the Arum *eſculentum*.

EDDY (Saxon), of *ed* "backward," and *ea* "water," among ſeamen, is where the water runs back contrary to the tide; or that which hinders the free paſſage of the ſtream, and ſo cauſes it to return again. That eddy water which falls back, as it were, on the rudder of a ſhip under ſail, the ſeamen call the *dead water*.

Eddy-Wind is that which returns or is beat back from a ſail, mountain, or any thing that may hinder its paſſage.

EDELINCK (Gerard), a famous engraver, born at Antwerp, where he was inſtructed in drawing and engraving. He ſettled at Paris, in the reign of Louis XIV. who made him his engraver in ordinary. Edelinck was alſo counſellor in the Royal Academy of Painting. His works are particularly eſteemed for the neatneſs of the engraving, their brilliant caſt, and the prodigious eaſe apparent in the execution; and to this facility is owing the great number of plates we have of his; among which are excellent portraits of a great number of illuſtrious men of his time. Among the moſt admired of his prints, the following may be ſpecified as holding the chief place. 1. A Battle between four Horſemen, with three figures lying ſlain upon the ground, from Leonardo da Vinci. 2. A holy Family, with Elizabeth, St John, and two Angels, from the famous picture of Raphael in the king of France's collection. The firſt impreſſions are before the arms of M. Colbert were added at the bottom of the plate; the ſecond are with the arms; and in the third the arms are taken out, but the place where they had been inſerted is very perceptible. 3. Mary Magdalen bewailing her ſins, and trampling upon the riches of the world, from Le Brun. The firſt impreſſions are without the narrow border which ſurrounds the print. 4. Alexander entering into the Tent of Darius, a large print on two plates, from Le Brun. This engraving belongs to the three battles, and triumphal entry of Alexander into Babylon, by Girard Audran, and completes the ſet. The firſt impreſſions have the name of *Goyton* the printer at the bottom. 5. Alexander entering into the Tent of Darius (finiſhed by P. Drevet), from Peter Mignard. Edelinck died in 1707, in an advanced age, at the Hotel Royal at the Gobelins, where he had an apartment. He had a brother named *John*, who was a ſkilful engraver, but died young.

EDEN (Moſes), the name of a country, with a garden, in which the progenitors of mankind were ſettled by God himſelf: The term denotes pleaſure or delight. It would be endleſs to recount the ſeveral opinions concerning its ſituation, ſome of them very wild and extravagant. Moſes ſays, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is ſuppoſed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: ſo that the two channels before, and the other two after their confluence, conſtitute the heads mentioned by Moſes. Which will determine the ſituation of the garden to have been in the ſouth of Meſopotamia, or in Babylonia. The garden was alſo called *Paradiſe;* a term of Perſic original, denoting a garden. See Paradise.

EDGINGS, in gardening, the ſeries of ſmall but durable plants, ſet round the edges or borders of flower-beds, &c. The beſt and moſt durable of all plants for this uſe, is box; which, if well planted, and rightly managed, will continue in ſtrength and beauty for many years. The ſeaſons for planting this, are the autumn, and very early in the ſpring: and the beſt ſpecies for this purpoſe is the dwarf Dutch box.

Formerly, it was alſo a very common practice to plant borders, or edgings, of aromatic herbs; as thyme, ſavory, hyſſop, lavender, and the like: but theſe are all apt to grow woody, and to be in part, or wholly, deſtroyed in hard winters. Daiſies, thrift, or ſea july-flower, and camomile, are alſo uſed by ſome for this purpoſe: but they require yearly tranſplanting, and a great deal of trouble, elſe they grow out of form; and they are alſo ſubject to periſh in very hard ſeaſons.

EDHILING, Edhilingus, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, ſays Nithard (Hiſt. lib. iv.) is divided into three orders or claſſes of people; the *edhilingi*, the *frilingi*, and the *lazzi;* which ſignify the nobility, the freemen, and the vaſſals or ſlaves.

Inſtead of *edhiling*, we ſometimes meet with *atheling*, or *etheling;* which appellation was likewiſe given to the king's ſon, and the preſumptive heir of the crown. See Atheling.

EDICT, in matters of polity, an order or inſtrument, ſigned and ſealed by a prince, to ſerve as a law to his ſubjects. We find frequent mention of the edicts of the prætor, the ordinances of that officer in the Roman law. In the French law, the edicts are of ſeveral kinds: ſome importing a new law or regulation; others, the erection of new offices; eſtabliſhments of duties, rents, &c.; and ſometimes articles of pacification. In France, edicts are much the ſame as a proclamation is with us: but with this difference, that the former have the authority of a law in themſelves, from the power which iſſues them forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themſelves.

EDILE, or Ædile. See Ædile.

EDINBURGH, a city of Mid-Lothian in Scotland, ſituated in W. Long. 3°, and N. Lat. 56°, near the ſouthern bank of the river Forth.—The origin of the name, like that of moſt other cities, is very uncertain. Some imagine it to be derived from Eth, a ſuppoſed king of the Picts; others from Edwin, a Saxon prince of Northumberland, who over-ran the whole or greateſt part of the territories of the Picts about the year 617; while others chooſe to derive it from two Gaelic words *Dun Edin*, ſignifying the face of a hill. The name *Edinburgh* itſelf, however, ſeems to have been unknown in the time of the Romans. The moſt ancient title by which we find this city diſtinguiſhed is that of *Caſtelh Mynyd Agned;* which, in the Britiſh language, ſignifies "the fortreſs of the hill of St Agnes." Afterwards it was named *Caſtrum Puellarum*, becauſe the Pictiſh princeſſes were educated in the caſtle (a neceſſary protection in thoſe barbarous ages) till they were married.—The ages in which theſe names were given cannot indeed now be exactly aſcertained: but the town certainly cannot boaſt of very great antiquity; ſince, as Mr Whittaker informs us, the celebrated King Arthur fought a battle on the ſpot where it is ſituated towards the end of the fifth century.

1 Origin of the name.

2 Time of its foundation uncertain.

The Romans, during the time they held the dominion of part of this iſland, divided their poſſeſſions into ſix provinces. The moſt northerly of theſe was called *Valentia*, which comprehended all the ſpace between the walls of Adrian and Severus. Thus, Edinburgh, lying on the very out-ſkirts of that province which was moſt expoſed to the ravages of the barbarians, became perpetually ſubject to wars and devaſtations; by means of which, the time of its firſt foundation cannot now be gueſſed at.

The caſtle is certainly very ancient. It continued in the hands of the Saxons or Engliſh from the invaſion of Octa and Ebuſa in the year 452 till the defeat of Egfrid king of Northumberland in 685 by the Picts, who then repoſſeſſed themſelves of it. The Saxon kings of Northumberland reconquered it in the ninth century; and it was retained by their ſucceſſors till the year 956, when it was given up to Indulphus king of Scotland. In 1093 it was unſucceſsfully beſieged by the uſurper Donald Bane. Whether the city was at that time founded or not is uncertain. Moſt probably it was: for as protection from violence was neceſſary in thoſe barbarous ages, the caſtle of Edinburgh could not fail of being an inducement to many people to ſettle in its neighbourhood; and thus the city would gradually be founded and increaſe.—In 1128, King David I. founded the Abbey of Holyroodhouſe, for certain canons regular; and granted them a charter, in which he ſtyled the town *Burgo meo de Edwineſburg*, "my borough of Edinburgh." By the ſame charter he granted theſe canons 40 ſhillings yearly out of the town revenues; and likewiſe 48 ſhillings more, from the ſame, in caſe of the failure of certain duties payable from the king's revenue; and likewiſe one half of the tallow, lard, and hides, of all the beaſts killed in Edinburgh.

3
Caſtle ſurrendered to the Engliſh.

In 1174, the caſtle of Edinburgh was ſurrendered to Henry II. of England, in order to purchaſe the liberty of King William I. who had been defeated and taken priſoner by the Engliſh. But when William recovered his liberty, he entered into an alliance with Henry, and married his couſin Ermengarde; upon which the caſtle was reſtored as part of the queen's dower.

In 1215, this city was firſt diſtinguiſhed by having a parliament and provincial ſynod held in it.—In 1296, the caſtle was beſieged and taken by Edward I. of England; but was recovered in 1313 by Randolf Earl of Moray, who was afterwards regent of Scotland during the minority of King David II. At laſt King Robert deſtroyed this fortreſs, as well as all others in Scotland, leſt they ſhould afford ſhelter to the Engliſh in any of their after incurſions into Scotland.—It lay in ruins for a conſiderable number of years; but was afterwards rebuilt by Edward III. of England, who placed a ſtrong garriſon in it.

In 1341 it was reduced by the following ſtratagem. A man, pretending to be an Engliſh merchant, came to the governor, and told him that he had on board his ſhip in the Forth ſome wine, beer, biſcuits, &c. which he would ſell him on very reaſonable terms. A bargain being made, he promiſed to deliver the goods next morning at a very reaſonable rate: but at the time appointed, twelve men, diſguiſed in the habit of ſailors, entered the caſtle with the goods and ſuppoſed merchant; and having inſtantly killed the porter and centinels, Sir William Douglas, on a preconcerted ſignal, ruſhed in with a band of armed men, and quickly made himſelf maſter of the place, after having cut moſt of the garriſon in pieces.

4
Cruel execution of the murderers of James I.

The year 1437 is remarkable for the execution of the Earl of Athol and his accomplices, who had a concern in the murder of James I. The crime, it muſt be owned, was execrable; but the puniſhment was altogether ſhocking to humanity. For three days ſucceſſively the aſſaſſins were tortured by putting on their heads iron crowns heated red hot, diſlocating their joints, pinching their fleſh with red hot pincers, and carrying them in that dreadful ſituation through the ſtreets upon hurdles. At laſt an end was put to their ſufferings, by cutting them up alive, and ſending the parts of their mangled bodies to the principal towns of the kingdom.

5
Edinburgh becomes the capital of Scotland.

About the end of the 14th century it was cuſtomary to conſider Edinburgh as the capital of the kingdom. The town of Leith, with its harbour and mills, had been beſtowed upon it by Robert I. in 1329; and his grandſon John Earl of Carrick, who afterwards aſcended the throne by the name of Robert III. conferred upon all the burgeſſes the ſingular privilege of building houſes in the caſtle, upon the ſole condition that they ſhould be perſons of good fame; which we muſt undoubtedly conſider as a proof that the number of theſe burgeſſes was at that time very ſmall. In 1461 a very conſiderable privilege was conferred on the city by Henry VI. of England when in a ſtate of exile; *viz.* that its inhabitants ſhould have liberty to trade to all the Engliſh ports on the ſame terms with the city of London. This extraordinary privilege was beſtowed in conſequence of the kindneſs with which that king was treated in a viſit to the Scottiſh monarch at Edinburgh; but as Henry was never reſtored, his gratitude was not attended with any benefit to this city. From this time, however, its privileges continued to be increaſed from various cauſes. In 1482 the citizens had an opportunity of liberating King James from the oppreſſion of his nobles, by whom he had been impriſoned in the caſtle. On this account the provoſt was by that monarch made hereditary high ſheriff within the city, an office which he continues ſtill to enjoy. The council at the ſame time were inveſted with the power of making laws and ſtatutes for the government of the city; and the trades, as a teſtimony of the royal gratitude for their loyalty, received the banner known by the name of the *Blue Blanket*; an enſign formerly capable of producing great commotions, but which has not now been diſplayed for many years paſt. However, it ſtill exiſts; and the convener of the trades has the charge of keeping it.

6
Venereal diſeaſe imported.

It was not long after the diſcovery of America that the venereal diſeaſe, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a moſt dreadful plague; and the unhappy perſons affected with it were ſeparated as effectually as poſſible from ſociety. The place of their exile was Inchkeith, a ſmall iſland near the middle of the Forth; which, ſmall as it is, has a ſpring of freſh water, and now affords paſture to ſome ſheep.

7
Origin of the town-guard.

By the overthrow of James IV. at the battle of Flowden, the city of Edinburgh was overwhelmed with grief and confuſion, that monarch having been attended in his unfortunate expedition by the Earl of Angus, then provoſt, with the reſt of the magiſtrates, and a number of the principal inhabitants, moſt of whom periſhed in the battle. After this diſaſter, the inhabitants being alarmed for the ſafety of their city, it was enacted that every fourth man ſhould keep watch at night; the fortifications of the town were renewed, the wall being alſo extended in ſuch a manner as to incloſe the Graſsmarket, and the field on which Heriot's Hoſpital, the Grey Friars Church, and Charity Workhouſe, ſtand. On the eaſt ſide it was made to incloſe the College, Infirmary, and High School; after which, turning to the north, it met the old wall at the Netherbow-port. After this alarm was over, the inhabitants were gradually relieved from the trouble of watching at night, and a certain number of militia appointed to prevent diſturbances; who continue to this day, and are known by the name of the *Town Guard*. Before theſe new incloſures, moſt of the principal people lived in the Cowgate without the wall; and the burying-place was ſituated where the Parliament Cloſe now is. In our days of peace, when no alarm of an enemy is at all probable, great part of the walls, with all the gates, have been taken down, and the city laid quite open, in order to afford more ready paſſage to the great concourſe of people with whom the ſtreet is daily filled. But at the period we ſpeak of, not only were the inhabitants much leſs numerous by reaſon of the ſmall extent of the city, but it was depopulated by a dreadful plague; ſo that, to ſtop if poſſible the progreſs of the infection, all houſes and ſhops were ſhut up for 14 days, and ſome where infected perſons had died were pulled down altogether.

8
Erection of wooden houſes.

In 1504, the tract of ground called the *Burrough Muir* was totally overgrown with wood, though now it affords not the ſmalleſt veſtige of having been in ſuch a ſtate. So great was the quantity at that time, however, that it was enacted by the town-council, that whoever inclined to purchaſe as much wood as was ſufficient to make a new front for their houſe, might extend it ſeven feet into the ſtreet. Thus the city was in a ſhort time filled with houſes of wood inſtead of ſtone; by which, beſides the inconvenience of having the ſtreet narrowed 14 feet, and the beauty of the whole entirely marred, it became much more liable to accidents by fire: but almoſt all theſe are now pulled down; and in doing this a ſingular taſte in the maſonry which ſupported them is ſaid to have been diſcovered.

9
Edinburgh deſtroyed by the Engliſh.

In 1542, a war with England having commenced through the treachery of Cardinal Beaton, an Engliſh fleet of 200 ſail entered the Forth; and having landed their forces, quickly made themſelves maſters of the towns of Leith and Edinburgh. They next attacked the caſtle, but were repulſed from it with loſs; and by this they were ſo enraged, that they not only deſtroyed the towns of Edinburgh and Leith, but laid waſte the country for a great way round.—Theſe towns, however, ſpeedily recovered from their ruinous ſtate; and, in 1547, Leith was again burned by the Engliſh after the battle of Pinkey, but Edinburgh was ſpared.

Several diſturbances happened in this capital at the time of the Reformation, of which an account is given under the article Scotland; but none of theſe greatly affected the city till the year 1570, at which time there was a civil war on account of Q. Mary's forced reſignation. The regent, who was one of the contending parties, bought the caſtle from the perfidious governor (Balfour) for 5000 l. and the priory of Pittenweem. He did not, however, long enjoy the fruits of this infamous bargain. Sir William Kirkaldy, the new governor, a man of great integrity and bravery, declared for the Queen. The city in the mean time was ſometimes in the hands of one party and ſometimes of another; during which contentions, the inhabitants, as may eaſily be imagined, ſuffered extremely. In the year 1570 above mentioned, Queen Elizabeth ſent a body of 1000 foot and 300 horſe, under the command of Sir William Drury, to aſſiſt the king's party. The caſtle was ſummoned to ſurrender; and ſeveral ſkirmiſhes happened during the ſpace of two years, in which a kind of predatory war was carried on. At laſt a truce was agreed on till the month of January 1573; and this opportunity the Earl of Morton, now regent, made uſe of to build two bulwarks acroſs the high-ſtreet, nearly oppoſite to the tolbooth, to defend the city from the fire of the caſtle.

10
Siege of the caſtle in Queen Elizabeth's time.

On the firſt of January, early in the morning, the governor began to cannonade the city. Some of the cannon were pointed againſt the fiſh-market, then held on the high ſtreet; and the bullets falling among the fiſhes, ſcattered them about in a ſurpriſing manner, and even drove them up ſo high in the air, that they fell down upon the tops of the houſes. This unuſual ſpectacle having brought a number of people out of their houſes, ſome of them were killed and others dangerouſly wounded. Some little time afterwards, ſeveral houſes were ſet on fire by ſhot from the caſtle, and burned to the ground; which greatly enraged the people againſt the governor.—A treaty was at laſt concluded between the leaders of the oppoſite factions; but Kirkaldy refuſed to be comprehended in it. The regent therefore ſolicited the aſſiſtance of Queen Elizabeth, and Sir William Drury was again ſent into Scotland with 1500 foot and a train of artillery. The caſtle was now beſieged in form, and batteries raiſed againſt it in different places. The governor defended himſelf with great bravery for 33 days; but finding moſt of the fortifications demoliſhed, the well choaked up with rubbiſh, and all ſupplies of water cut off, he was obliged to ſurrender. The Engliſh general, in the name of his miſtreſs, promiſed him honourable treatment; but the Queen of England ſhamefully gave him up to the regent, by whom he was hanged.

Soon after this, the ſpirit of fanaticiſm, which ſomehow or other ſucceeded the Reformation, produced violent commotions, not only in Edinburgh, but thro' the whole kingdom. The foundation of theſe diſturbances, and indeed of moſt others which have ever happened in Chriſtendom on account of religion, was that pernicious maxim of Popery, that the church is independent of the ſtate. It is not to be ſuppoſed that this maxim was at all agreeable to the ſovereign; but ſuch was the attachment of the people to the doctrines of the clergy, that King James found himſelf obliged to compound matters with them. This, however, anſwered the purpoſe but very indifferently; and at laſt a violent uproar was excited. The King was then ſitting in the Court of Seſſion, which was held in the Tolbooth, when a petition was preſented to him by ſix perſons, lamenting the dangers which threatened religion; and being treated with very little reſpect by one Bruce a miniſter, his Majeſty aſked who they were that dared to convene againſt his proclamation? He was anſwered.

11
The city incurs the diſpleaſure of James VI.

ed by Lord Lindſay, that they dared to do more, and would not ſuffer religion to be overthrown. On this the King perceiving a number of people crowding into the room, withdrew into another without making any reply, ordering the door to be ſhut. By this the petitioners were ſo much enraged, that on their return to the church the moſt furious reſolutions were taken; and had it not been for the activity of Sir Alexander Home the provoſt, and Mr Watt the deacon-convener who aſſembled the crafts in his Majeſty's behalf, it is more than probable that the door would have been forced, and an end put to his life. This affront was ſo much reſented by the King, that he thought proper to declare Edinburgh an unfit place of reſidence for the court or the adminiſtration of juſtice. In conſequence of this declaration, he commanded the college of juſtice, the inferior judges, and the nobility and barons, to retire from Edinburgh, and not to return without expreſs licence. This unexpected declaration threw the whole town into conſternation, and brought back the magiſtrates and principal inhabitants to a ſenſe of their duty. With the clergy it was far otherwiſe. They railed againſt the King in the moſt furious manner; and endeavouring to perſuade the people to take up arms, the magiſtrates were ordered to impriſon them: but they eſcaped by a timely flight. A deputation of the moſt reſpectable burgeſſes was then ſent to the King at Linlithgow, with a view to mitigate his reſentment. But he refuſed to be pacified; and on the laſt day of December 1596 entered the town between two rows of his ſoldiers who lined the ſtreets, while the citizens were commanded to keep within their houſes. A convention of the eſtates was held in the Tolbooth, before whom the magiſtrates made the moſt abject ſubmiſſions, but all in vain. The convention declared one of the late tumults, in which an attack had been made upon the King's perſon, to be high treaſon; and ordained, that if the magiſtrates did not find out the authors, the city itſelf ſhould be ſubjected to all the penalties due to that crime. It was even propoſed to raze the town to the foundation, and erect a pillar on the ſpot where it had ſtood, as a monument of its crimes. The inhabitants were now reduced to the utmoſt deſpair; but Queen Elizabeth interpoſing in behalf of the city, the King thought proper to abate ſomewhat of his rigour. A criminal proſecution, however, was commenced, and the town-council were commanded to appear at Perth by the firſt of February. On their petition, the time for their appearance was prolonged to the firſt of March; and the attendance of 13 of the common-council was declared ſufficient, provided they had a proper commiſſion from the reſt. The trial commenced on the fifth day of the month; and one of the number having failed in his attendance, the cauſe was immediately decided againſt the council: they were declared rebels, and their revenues forfeited.

12
It is again received into favour.

For 15 days the city continued in the utmoſt confuſion; but at laſt, on their earneſt ſupplication, and offering to ſubmit entirely to the King's mercy, the community were reſtored on the following conditions, which they had formerly proffered: That they ſhould continue to make a moſt diligent ſearch for the authors of the tumult, in order to bring them to condign puniſhment; that none of the ſeditious miniſters ſhould be allowed to return to their charges, and no others admitted without his Majeſty's conſent; and that in the election of their magiſtrates they ſhould preſent a liſt of the candidates to the King and his lords of council and ſeſſion, whom his Majeſty and their lordſhips might approve or reject at pleaſure. To theſe conditions the King now added ſome others; *viz.* that the houſes which had been poſſeſſed by the miniſters ſhould be delivered up to the King; and that the clergymen ſhould afterwards live diſperſed through the town, every one in his own pariſh: That the town-council houſe ſhould be appointed for accommodating the court of exchequer; and that the town ſhould become bound for the ſafety of the lords of ſeſſion from any attempts of the burgeſſes, under a penalty of 40,000 merks; and, laſtly, that the town ſhould immediately pay 20,000 merks to his Majeſty.

Upon theſe terms a reconciliation took place; which appears to have been very complete, as the King not only allowed the degraded miniſters to be replaced, but in 1610 conferred a mark of his favour on the town, by allowing the provoſt to have a ſword of ſtate carried before him, and the magiſtrates to wear gowns on public occaſions. In 1618 he paid his laſt viſit to this city, when he was received with the moſt extravagant pomp and magnificence. See SCOTLAND.

13
Proceedings of the magiſtrates, &c.

The events which during this period, regard the internal police of the city, were principally the following. After the unfortunate battle at Pinkey, the magiſtrates, probably apprehending that now their power was enlarged by reaſon of the common calamity, proceeded in ſome reſpects in a very arbitrary manner; forcing the inhabitants to furniſh materials for the public works; enjoining merchants to bring home ſilver to be coined at the mint; and ordering lanterns to be hung out at proper places to burn till nine at night, &c. Another invaſion from England being apprehended in 1558, the city raiſed 1450 men for its defence, among whom there are ſaid to have been 200 tailors, ſo that their profeſſion ſeems to have been in a very flouriſhing ſtate at that time. During the diſturbances which happened at the reformation, and of which a particular account is given under the article SCOTLAND, it was enacted, that the figure of St Giles ſhould be cut out of the town ſtandard, and that of a thiſtle inſerted in its place. It was likewiſe enacted, that none but thoſe who profeſſed the reformed religion ſhould ſerve in any office whatever; and the better to preſerve that extraordinary appearance of ſanctity which was affected, a pillar was erected in the North Loch, for the purpoſe of ducking fornicators.

In 1595, the boys of the High School roſe againſt their maſters; and ſuch was the barbariſm of thoſe days, that one of theſe ſtriplings ſhot a magiſtrate with a piſtol, who had come along with the reſt to reduce them to obedience. The reaſon of the uproar was, that they were in that year refuſed two vacations, which had been cuſtomary in former times: however, they were at laſt obliged to ſubmit, and ever ſince have been allowed only one for about ſix weeks in the autumn. The ſame year the houſe of one of the bailies was aſſaulted by the tradeſmens ſons, aſſiſted by journeymen who had not received the freedom of the town: he eſcaped with his life, but the offenders were baniſhed the city for ever.

14 Diſturbances in the time of Charles I.

In the beginning of the reign of Charles I. a perfect harmony ſeems to have ſubſiſted between the court and the city of Edinburgh; for in 1627 king Charles I. preſented the city with a new ſword and gown to be worn by the provoſt at the times appointed by his father James VI. Next year he paid a viſit to this capital, and was received by the magiſtrates in a moſt pompous manner; but ſoon after this the diſturbances aroſe which were not terminated but by the death of that unfortunate monarch. Theſe commenced on an attempt of Charles to introduce Epiſcopacy into the kingdom; and the firſt ſtep towards this was the erection of the three Lothians and part of Berwick into a dioceſe, Edinburgh being the epiſcopal ſeat, and the church of St Giles the cathedral. An account of the diſturbance occaſioned by the firſt attempt to read the prayer-book there, is given under the article BRITAIN; but though the attempt was given over, the minds of the people were not to be quieted. Next winter they reſorted to town in ſuch multitudes, that the privy-council thought proper to publiſh two acts; by one of which the people were commanded, under ſevere penalties, to leave the town in 24 hours; and by the other, the court of ſeſſion was removed to Linlithgow. The populace and their leaders were ſo much enraged by the latter, that lord Traquair and ſome of the biſhops narrowly eſcaped with their lives; and next year (1638) matters became ſtill more ſerious. For now, the king having provoked his ſubjects throughout all Scotland with the innovations he attempted in religion, Edinburgh was made the general place of rendezvous, and the moſt formidable aſſociations took place; an account of which has already been given under the article BRITAIN. Each of the towns in Scotland had a copy; and that which belonged to Edinburgh, crowded with 5000 names, is ſtill preſerved among the records of the city. Notwithſtanding this diſagreement, however, the king once more viſited Edinburgh in 1641, and was entertained by the magiſtrates at an expence of 12,000l. Scots. It does not appear that after this the city was in any way particularly concerned with the diſturbances which followed either throughout the remainder of the reign of Charles I. the commonwealth, or the reign of Charles II. In 1680 the duke of York with his ducheſs, the princeſs Anne, and the whole court of Scotland, were entertained by the city in the Parliament Houſe, at the expence of 15,000l. Scots. At this time it is ſaid that the ſcheme of building the bridge over the North Loch was firſt projected by the duke.

15 Regulations made by the magiſtrates.

From the time that king James VI. paid his laſt viſit to Edinburgh in 1618, till the time of the union in 1707, a conſiderable number of private regulations were made by the magiſtrates; ſome of them evidently calculated for the good of the city, others ſtrongly characteriſtic of that violent ſpirit of fanaticiſm which prevailed ſo much in the laſt century. Among the former was an act paſſed in 1621, that the houſes, inſtead of being covered with ſtraw or boards, ſhould have their roofs conſtructed of ſlate, tiles, or lead. This act was renewed in 1667; and in 1698 an act was paſſed regulating their height alſo. By this they were reſtrained to five ſtories, and the thickneſs of the wall determined to be three feet at bottom. In 1684 a lantern with a candle was ordered to be hung out in the firſt floor of every houſe in order to light the ſtreets at night; and there were two coaches with four horſes each ordered to be bought for the uſe of the magiſtrates; but it does not appear how long they continued to be uſed. In 1681 the court of ſeſſion diſcontinued its ſittings in ſummer: but as this was found to be attended with inconvenience, an act was paſſed for their reſtoration, which has continued ever ſince. During the time of the civil war in 1649, the city was viſited by the plague, which is the laſt time that dreadful diſtemper hath made its appearance in this country. The infection was ſo violent, that the city was almoſt depopulated, the priſoners were diſcharged from the tolbooth, and an act was made for giving one Dr Joannes Politius a ſalary of 80l. Scots per month, for viſiting thoſe who were infected with the diſeaſe. In 1677 the firſt coffee-houſes were allowed to be opened, but none without a licence: and the ſame year the town-council regulated the price of penny-weddings; ordaining the men to pay no more than two ſhillings, and the women 18 pence; very extravagant prices having been exacted before.

In contradiſtinction to theſe ſalutary acts, we may ſtate thoſe which ſhow an extravagant deſire of preſerving the appearance of virtue in the female ſex, as if it had been poſſible for others to inſpire them with virtuous notions if they had not imbibed them of themſelves. In 1633 an act of council was paſſed, by which women were forbidden to wear plaids over their faces, under penalty of five pounds and the forfeiture of the plaid for the firſt fault. Baniſhment was the puniſhment of the third. The reaſon aſſigned for this act was, that matrons were not known from ſtrumpets and looſe women, while the plaid continued to be worn over the face. This act was renewed in 1637 and 1638. Succeeding town-councils continued to ſhow the ſame regard to theſe matters; for in 1695 they enacted, that no inn-keeper, vintner, or ale-ſeller, ſhould for the future employ women as waiters or ſervants, under the penalty of five ſhillings ſterling for each.

The following anecdote may perhaps make the virtues of theſe legiſlators themſelves wear a ſuſpicious aſpect. In 1649 the city having borrowed L. 40,000 Scots, in order to raiſe their quota of men for his majeſty, the payment of it was abſolutely refuſed by the town-council when a demand was made for that purpoſe. That they might not, however, depend entirely upon their own opinion in a matter of ſuch importance, they took that of the General Aſſembly upon the ſubject; and it was determined by theſe reverend divines, that they were not in conſcience bound to pay for an unlawful engagement which their predeceſſors had entered into. But in 1652, Cromwell's parliament, who pretended to no leſs ſanctity than they, declared themſelves of a very different opinion; and on the application of one of the creditors, forced them to repay the ſum.

16 Infamous treatment of the marquis of Montroſe.

The treatment which the brave marquis of Montroſe met with, likewiſe fixes an indelible ſtigma both upon the magiſtrates and clergy at that time. Having been put under ſentence of excommunication, no perſon was allowed to ſpeak to him or do him the leaſt office of friendſhip. Being met without the city by the magiſtrates and town-guard, he was by them conducted in a kind of gloomy proceſſion through the ſtreets bareheaded, and in an elevated cart made for the purpoſe; the other priſoners walking two and two before him. At the time of his execution he was attended by one of the miniſters, who, according to his own account, did not chooſe to return till *he had ſeen him caſten over the ladder*.

17 Loyalty of the city in 1715 and 1725.

The union in 1707 had almoſt produced a war between the two kingdoms which it was deſigned to unite; and on that occaſion Edinburgh became a ſcene of the moſt violent diſturbances, of which a particular account is given under the article Britain. During the time the act was paſſing, it was found abſolutely neceſſary for the guards and four regiments of foot to do duty in the city. The diſturbances were augmented by the diſagreement of the two members of parliament; and notwithſtanding the victory gained at that time by the court party, Sir Patrick Johnſton the provoſt, who voted for the union, was obliged afterwards to leave the country. In 1715 the city remained faithful to the royal cauſe, and proper meaſures were taken for its defence. A committee of ſafety was appointed, the city-guard increaſed, and 400 men raiſed at the expence of the town. The trained bands likewiſe were ordered out, 100 of whom mounted guard every night: by which precautions the rebels were prevented from attempting the city: they however made themſelves maſters of the citadel of Leith; but fearing an attack from the duke of Argyle, they abandoned it in the night-time. A ſcheme was even laid for becoming maſters of the caſtle of Edinburgh; for which purpoſe they bribed a ſerjeant to place their ſcaling ladders. Thus ſome of the rebels got up to the top of the walls before any alarm was given; but in the mean time the plot being diſcovered by the ſerjeant's wife, her huſband was hanged over the place where he had attempted to introduce the rebels. The expence of the armament which the city had been at on this occaſion amounted to about 1700l. which was repaid by government in the year 1721.

18 Captain Porteous executed by a mob.

The loyalty of this city was ſtill farther remarkable in the year 1725, when diſturbances were excited in all parts of the kingdom, particularly in the city of Glaſgow, concerning the exciſe-bill; for all remained quiet in Edinburgh, notwithſtanding the violent outcries that were made elſewhere: and ſo remarkable was the tranquillity in the metropolis, that government afterwards returned thanks to the magiſtrates for it. In 1736, however, the city had again the misfortune to fall under the royal diſpleaſure, on the following account. Two ſmugglers having been detected in ſtealing their own goods out of a cuſtom-houſe, were condemned to be hanged. The crime was looked upon as trivial; and therefore a general murmur prevailed among the populace, which was no doubt heightened by the following accident. At that time it had been cuſtomary for perſons condemned to die to be carried each Sunday to the church, called from that circumſtance the *Tolbooth-church*. The two priſoners juſt mentioned were conducted in the uſual way, guarded by three ſoldiers, to prevent their making their eſcape: but having once gone thither a little before the congregation met, one of the priſoners ſeized one of the guards in each hand, and the other in his teeth, calling out to his companion to run; which he immediately did with ſuch ſpeed, that he ſoon got out of ſight, and was never heard of afterwards. The perſon who had thus procured the life of his companion without regard to his own, would no doubt become a general object of compaſſion; and of courſe, when led to the place of execution, the guard were ſeverely pelted by the mob, and ſome of them, according to the teſtimony of the witneſſes who were ſworn on the occaſion, pretty much wounded. By this Captain Porteous, who commanded the guard, was ſo much provoked, that he gave orders to fire, by which ſix people were killed and eleven wounded. The evidence, however, even of the fact that the orders to fire were given, appears not to have been altogether unexceptionable; nevertheleſs, on this he was tried and condemned to be executed. At that time the king was abſent at Hanover, having left the regency in the hands of the queen; and the caſe of the unfortunate Porteous having been repreſented to her, ſhe was pleaſed to grant him a reprieve: but ſuch was the inveteracy of the people againſt him, that they determined not to allow him to avail himſelf of the royal clemency. On the day that had been appointed for his execution, therefore, a number of people aſſembled, ſhut the gates of the city, and burnt the door of the priſon, the ſame which the mob would formerly have broke open in order to murder king James. They then took out Porteous, whom it was found impoſſible to reſcue out of their hands, though every method that the magiſtrates could take for that purpoſe in ſuch a confuſion was made uſe of. It was even proved, that the member of parliament went to the commander in chief, and requeſted that he would ſend a party of ſoldiers to quell the diſturbance, but was abſolutely denied this requeſt, becauſe he could not produce a written order from the provoſt to this purport; which, in the confuſion then exiſting in the city, could neither have been expected to be given by the provoſt, nor would it have been ſafe for any perſon to have carried it about him. Thus the unhappy victim was left in the hands of his executioners; and being dragged by them to the place deſtined for receiving his fate, was hanged on a dyer's ſign-poſt. As they had not brought a rope along with them, they broke open a ſhop where they knew they were to be had; and having taken out what they wanted, left the money upon the table, and retired without committing any other diſorder.

19 Government highly incenſed on that account.

Such an atrocious inſult on government could not but be highly reſented. A royal proclamation was iſſued, offering a pardon to any accomplice, and a reward of L. 200 to any perſon who would diſcover one of thoſe concerned. The proclamation was ordered to be read from every pulpit in Scotland the firſt Sunday of every month for a twelvemonth: but ſo divided were the people in their opinions about this matter, that many of the clergy heſitated exceedingly about complying with the royal order, by which they were brought in danger of being turned out of their livings; while thoſe who complied were rendered ſo unpopular, that their ſituation was rendered ſtill worſe than the others. All the efforts of government, however, were inſufficient to produce any diſcovery; by which, no doubt, the court were ſtill more exaſperated: and it was now determined to execute vengeance on the magiſtrates and city at large. Alexander Wilſon, the provoſt at that time, was impriſoned three weeks before he could be admitted to bail; after which, he and the four bailies, with the lords of juſticiary, were ordered to attend the houſe of peers at London. On their arrival there, a debate enſued, whether the lords ſhould attend in their robes or not? but at laſt it was agreed, that they ſhould attend in their robes at the bar. This, however, was refuſed by their lordſhips, who inſiſted that they ſhould be examined within the bar; upon which the affair of their examination was dropped altogether. A bill was at laſt paſſed both houſes, by which it was enacted, that the city of Edinburgh ſhould be fined in 2000 l. for the benefit of Porteous's widow (though ſhe was prevailed upon to accept of L. 1500 for the whole); and the provoſt was declared incapable of ever ſerving government again in any capacity whatever. To prevent ſuch cataſtrophes in time coming, the town-council enacted, that, on the firſt appearance of an inſurrection, the chief officers in the different ſocieties and corporations ſhould repair to the council, to receive the orders of the magiſtrates for the quelling of the tumult, under the penalty of 8 l. 6 s. 8 d. for each omiſſion.

20 The city taken by the rebels in 1745.

In 1745, the city was inveſted by the Pretender's army; and on the 17th of September, the Netherbow-gate being opened to let a coach paſs, a party of Highlanders, who had reached the gate undiſcovered, ruſhed in, and took poſſeſſion of the city. The inhabitants were commanded to deliver up their arms at the palace of Holyroodhouſe; a certain quantity of military ſtores was required from the city, under pain of military execution; and an aſſeſſment of 2 s. 6 d. upon the pound was impoſed upon the *real* rents within the city and liberties, for defraying that expence.

The Pretender's army guarded all the avenues to the caſtle; but no ſigns of hoſtility enſued till the 25th of the month, when the garriſon being alarmed from ſome unknown cauſe, a number of cannon were diſcharged at the guard placed at the Weſt-port, but with very little effect. This gave occaſion to an order to the guard at the weigh-houſe, to prevent all intercourſe between the city and caſtle; and then the governor acquainted the provoſt by letter, that unleſs the communication was preſerved, he would be obliged to diſlodge the guard by means of artillery. A deputation was next ſent to the Pretender; acquainting him with the danger the city was in, and intreating him to withdraw the guard. With this he refuſed to comply; and the Highland centinels firing at ſome people who were carrying proviſions into the caſtle, a pretty ſmart cannonading enſued, which ſet on fire ſeveral houſes, killed ſome people, and did other damage. The Pretender then conſented to diſmiſs the guard, and the cannonading ceaſed. After the battle of Culloden, the provoſt of Edinburgh was obliged to ſtand a very long and ſevere trial, firſt at London and then at Edinburgh, for not defending the city againſt the rebels; which, from the ſituation and extent of the walls, every one muſt have ſeen to be impoſſible.

During this trial a very uncommon circumſtance happened; the jury having ſat two days, inſiſted that they could ſit no longer, and prayed for a ſhort reſpite. As the urgency of the caſe was apparent, and both parties agreed, the court, after long reaſoning, adjourned till the day following, taking the jury bound under a penalty of L. 500 each; when the court continued ſitting two days longer, and the jury were one day incloſed. The event was, that the provoſt was exculpated.

After the battle of Culloden the duke of Cumberland cauſed fourteen of the rebel ſtandards to be burned at the croſs: that of the pretender was carried by the common executioner, the others by chimney-ſweepers; the heralds proclaiming the name of the commanders to whom they belonged as they were thrown into the fire. At this time the city of Edinburgh felt a temporary inconvenience from the election of their magiſtrates not having taken place at the uſual time; ſo that it became neceſſary to apply to his majeſty for the reſtoration of the government of the city. This was readily granted, the burgeſſes being allowed a poll-tax; after which an entire new ſet of magiſtrates was returned, all of them friends to the houſe of Hanover; and ſoon after the freedom of the city in a gold box was preſented to the duke of Cumberland.

21 Government of the city reſtored.

With theſe tranſactions all interferences betwixt government and the metropolis of Scotland were ended; the reſt of its hiſtory therefore only conſiſts of internal occurrences, the regulations made by its own magiſtrates for the benefit of the city, their applications to government for leave to improve it, or the execution of theſe improvements; of which we ſhall now give a brief detail.

22 Salary beſtowed on the provoſt.

In the year 1716, the city firſt beſtowed a ſettled ſalary on the provoſt, in order to enable him to ſupport the dignity of firſt magiſtrate. This was at firſt L. 300; but has ſince been augmented to L. 500, which his lordſhip ſtill enjoys. In 1718 it was recommended to the magiſtrates to diſtinguiſh themſelves by wearing coats of black velvet, for which they were allowed L. 10; but this act being abrogated in 1754, gold chains were aſſigned as badges of their office, which they ſtill continue to wear. Provoſt Kincaid happened to die in office in the year 1777; which being a very rare accident, perhaps the only one of the kind to be met with in the records of Edinburgh, he was buried with great ſolemnity, and a vaſt concourſe of people attended.

23 Account of tumults.

Tumults have been frequent in Edinburgh, chiefly on account of the dearneſs of proviſions. In 1740 Bell's mills were firſt attacked by the populace, and afterwards Leith mills: nor could the rioters be diſperſed till the military had fired among them, and wounded three, of whom one died; and it was found neceſſary to order ſome dragoons into the city in order to preſerve tranquillity. In 1742 another violent tumult took place, owing to a cuſtom of ſtealing dead bodies from their graves for anatomical purpoſes, which had then become common. The populace beat to arms, threatened deſtruction to the ſurgeons; and in ſpite of all the efforts of the magiſtrates demoliſhed the houſe of the beadle at St Cuthbert's. In 1756, new diſturbances, which required the aſſiſtance of the military, took place: the cauſe at this time was the impreſſing of men for the war which was then commencing. A diſturbance was likewiſe excited in 1760. This was occaſioned by the footmen, who till then were allowed to follow their maſters into the playhouſe, and now took upon them to diſturb the entertainment of the company; the conſequence of which was, that they were turned out, and have ever ſince been obliged to wait for their maſters. In 1763 and 1765, the tumults on account of the price of proviſions were renewed; many of the meal-mongers had their houſes broken open and their ſhops deſtroyed. The magiſtrates, as uſual, were obliged to call in a party of dragoons to quell the diſturbance; but at the ſame time, to put an effectual ſtop, as far as was in their power, to theſe proceedings for the future, they gave ſecurity, that people who brought grain or proviſion into the market ſhould be ſecured in their property. Since that time there have been no tumults directly on the account of proviſions; though in 1784 a terrible riot and attack of a diſtillery at Canonmills took place, on a ſuppoſition that the diſtillers enhanced the price of meal by uſing unmalted grain. The attack was repelled by the ſervants of the diſtillery; but the mob could not be quelled until the ſheriff called the ſoldiers quartered in the caſtle to his aſſiſtance. The ſame night a party of rioters ſet out for Ford, a place ten miles to the ſouthward, where there was likewiſe a large diſtillery; which, as there was none to make any oppoſition, they ſoon deſtroyed. One man was killed in this riot at Edinburgh by the fire of a ſervant of the diſtillery, and ſeveral of the rioters were afterwards ſecured and puniſhed.

In the years 1778 and 1779 two very alarming diſturbances happened, which threatened a great deal of bloodſhed, though happily they were terminated without any. The firſt was a mutiny of the earl of Seaforth's Highland regiment, who were at this time quartered in the caſtle. Theſe having been ordered to embark, for ſome reaſon or other unanimouſly refuſed, and poſted themſelves on the top of Arthur's ſeat, where they continued for two days. Troops were collected to prevent their eſcape, and the inhabitants were ordered to keep within doors at the firſt toll of the great bell, which was to be a ſignal of violence about to take place; but fortunately all the fears, naturally ariſing from the expectation of this event, were diſſipated by an accommodation. The other happened on account of the attempt to repeal the penal laws againſt the Papiſts; and was much more alarming than the other, as being the effect of a premeditated ſcheme and determined reſolution to oppoſe government. On the 2d of February 1779 a mob aſſembled in the evening, burned a Popiſh chapel, and plundered another. Next day they renewed their depredations; deſtroying and carrying off the books, furniture, &c. of ſeveral Popiſh prieſts and others of that perſuaſion. The riot continued all that day, though the aſſiſtance of the military was called in; but happily no lives were loſt, nor was there any firing. The city was afterwards obliged to make good the damage ſuſtained by the Catholics on this occaſion, which was eſtimated at L.1500. This year alſo an unlucky accident happened at Leith. About 50 Highland recruits having refuſed to embark, a party of the South Fencibles was ſent to take them priſoners. Unexpectedly, however, the Highlanders ſtood upon their defence; when, after ſome words, a firing commenced on both ſides, and about one half of the Highlanders were killed and wounded, the remainder being taken priſoners and carried to the caſtle. Captain Manſfield and two or three privates were killed in this affray.

24
General hiſtory of the improvements.

We ſhall cloſe this hiſtory of Edinburgh with a general account of the improvements which have lately taken place in it, and of which a particular deſcription will afterwards be given. Theſe began in the year 1753, when the foundation-ſtone of the Exchange was laid, at which time there was a grand proceſſion, and the greateſt concourſe of people ever known in Edinburgh. A triumphal arch was erected for the purpoſe, through which the proceſſion paſſed, and medals were ſcattered among the populace. In 1756 the high ſtreet was cleared by the removal of the croſs; though many regretted this, on account of its being a very ancient and elegant building. In the middle it had an unicorn placed on the top of a pillar 20 feet high; but this fine ornament was broken to pieces by the giving way of the tackle by which it was attempted to remove it. It is now again erected at Drum, a ſeat belonging to lord Somerville, about four miles from Edinburgh. In 1763 the firſt ſtone of the north bridge was laid by provoſt Drummond; and in 1767 an act of parliament was obtained for extending the royalty of the city over the fields to the northward, where the New Town is now ſituated. About the ſame time a ſpot of ground upon the ſouth ſide of the town was purchaſed by a private perſon for L.1200, which being feued out for building, gave riſe to the increaſe of the town on that quarter; and this proceeded the more rapidly, as the houſes built there were free from the dues impoſed upon others ſubject to the royalty. In 1774 the foundation of the Regiſter-Office was laid. In 1784 the project for rendering the acceſs to the town equally eaſy on both ſides was begun to be put in execution by laying the foundation of the ſouth bridge. At the ſame time a great improvement was made by reducing the height of the ſtreet ſeveral feet all the way from the place where the croſs ſtood to the Netherbow; by which means the aſcent is rendered more eaſy, not only for carriages, but alſo for perſons who walk on foot. At the ſame time, the ſtreet was farther cleared by the removal of the town guard-houſe, which had long been complained of as an encumbrance. It is ſtill farther in contemplation to remove the Luckenbooths: and when this is accompliſhed, with other improvements by which it muſt neceſſarily be accompanied, it is to be queſtioned whether any city in Britain will be able to vie with Edinburgh in elegance and beauty.

Having thus given a conciſe hiſtory of the city from its earlieſt foundation, we ſhall now proceed to deſcribe it in its moſt improved ſtate.

25
Deſcription of Edinburgh.

Edinburgh is ſituated upon a ſteep hill, riſing from eaſt to weſt, and terminating in a high and inacceſſible rock, upon which the caſtle ſtands. At the eaſt end or lower extremity of this hill ſtands the abbey of Holyrood-houſe, or king's palace, diſtant from the caſtle upwards of a mile; and betwixt which, along the top of the ridge, and almoſt in a ſtraight line, runs the high-ſtreet. On each ſide, and parallel to this ridge or hill, is another ridge of ground lower than that in the middle, and which does not extend ſo far to the eaſt; that on the ſouth being intercepted by Saliſbury-rocks and Arthur's-ſeat, a hill of about 800 feet of perpendicular height; and that on the north by the Calton-hill, conſiderably lower than Arthur's-ſeat: ſo that the ſituation of this city is moſt ſingular and romantic; the eaſt or lower part of the town lying between two hills; and the weſt or higher part riſing up towards a third hill, little inferior in height to the higheſt of the other two, upon which, as has been obſerved, the caſtle is built, and overlooks the town.

The buildings of the town terminate at the diſtance of about 200 yards from the caſtle-gate; which ſpace affords a moſt delightful as well as convenient and healthful walk to the inhabitants. The proſpect from this ſpot is perhaps the fineſt any where to be met with, for extent, beauty, and variety.

In the valley or hollow betwixt the mid and the ſouth ridges, and nearly parallel to the high-ſtreet, is another ſtreet called the Cowgate; and the town has now extended itſelf over moſt part of that ſouth ridge alſo. Betwixt the mid and the north ridges was a loch, which, till of very late, terminated the town on that ſide. From the high-ſtreet towards the loch on the north, and Cowgate on the ſouth, run narrow croſs ſtreets or lanes, called *wynds* and *cloſes*, which grow ſteeper and ſteeper the farther weſt or nearer the caſtle; ſo that, were it not for the cloſeneſs and great height of the buildings, this city, from its ſituation and plan, might naturally be expected to be the beſt aired, as well as the cleaneſt, in Europe. The former, notwithſtanding theſe diſadvantages, it enjoys in an eminent degree; but we cannot compliment it upon the latter, notwithſtanding every poſſible means has been uſed by the magiſtrates for that purpoſe.

The ſteepneſs of the aſcent makes the acceſs to the high-ſtreet from the north and ſouth very difficult; which no doubt greatly retarded the enlargement of the city. To remedy this inconvenience on the north, and with a view to extend the town on that quarter, a moſt elegant bridge has been thrown over the north loch, which joins the north ridge to the middle of the high-ſtreet, by ſo eaſy an aſcent as one in ſixteen; and in purſuance of the deſign, a plan of a new town to the north was fixed upon, and is now nearly finiſhed, with an elegance and taſte that does honour to this country. In like manner, to facilitate the acceſs from the ſouth ſide, a bridge has been thrown over the valley through which the Cowgate runs; which, if not equally elegant with the north bridge, is certainly as convenient.

26
Account of the gradual increaſe of Edinburgh

The gradual increaſe of the city of Edinburgh may in ſome degree be underſtood from the traces of its ancient walls that ſtill remain. James II. in 1450, firſt beſtowed on the community the privilege of fortifying the city with a wall, and empowered them to levy a tax upon the inhabitants for defraying the expence. When the city was firſt fortified, the wall reached no farther than the preſent water-houſe, or reſervoir, on the caſtle-hill: from thence to the foot of Halkerſton's wynd, juſt below the new-bridge, the city was defended by the north-loch; an inconſiderable moraſs, which, being formerly overflowed, formed a ſmall lake that hath ſince been drained. From this place to the foot of Leith-wynd, it does not appear how the city was fortified: but from the foot of Leith-wynd to the Nether-bow-port it was defended only by a range of houſes; and when theſe had become ruinous, a wall was built in their place. The original wall of Edinburgh, therefore, began at the foot of the north-eaſt rock of the caſtle. Here it was ſtrengthened by a ſmall fortreſs, the ruins of which are ſtill to be ſeen, and are called the *well-houſe tower*, from their having a ſpring in their neighbourhood. When the wall came oppoſite to the reſervoir, it was carried quite acroſs the hill, having a gate on the top for making a communication between the town and caſtle. In going down the hill, it went ſlanting in an oblique direction to the firſt angle in going down the Weſt-bow, where was a gate named the *Upper-bow port*, one of the hooks of which ſtill remains. Thence it proceeded eaſtward in ſuch a manner, as would have cut off not only all the Cowgate, but ſome part of the parliament-houſe; and being continued as far as the mint-cloſe, it turned to the north-eaſt, and connected itſelf with the buildings on the north ſide of the high-ſtreet, where was the original *Nether-bow Port*, about 50 yards weſt from that which afterwards went by the ſame name.

Soon after the building of this wall, a new ſtreet was formed on the outſide of it, named the *Cowgate*, which in the 16th century became the reſidence of the nobility, the ſenators of the college of juſtice, and other perſons of the firſt diſtinction. After the fatal battle of Flowden, however, the inhabitants of the Cowgate became very anxious to have themſelves defended by a wall as well as the reſt. The wall of the city was therefore extended to its preſent limits. This new wall begins on the ſouth-eaſt ſide of the rock on which the caſtle is built, and to which the town-wall comes quite cloſe. From thence it deſcends obliquely to the Weſt-port; then aſcends part of a hill on the other ſide, called the *High Riggs*; after which, it runs eaſtward with but little alteration in its courſe, to the Briſto and Potter-row ports, and from thence to the Pleaſance. Here it takes a northerly direction, which it keeps from thence to the Cowgate-port; after which the incloſure is completed to the Netherbow by the houſes of St Mary's wynd. The original Netherbow port being found not well adapted for defence was pulled down, and a new one built in 1571 by the adherents of queen Mary. In 1606, the late handſome building was erected about 50 yards below the place where the former ſtood. It was two ſtories high, and had an elegant ſpire in the middle; but being thought to encumber the ſtreet, and the whole building being in a crazy ſituation, it was pulled down by order of the magiſtrates in 1764.

In the original wall of Edinburgh there was, as has been already obſerved, a port on the caſtle-hill. On the extenſion of the wall, after building the houſes in the Cowgate, this gate was pulled down. That in the upper or weſt bow ſtood for a much longer time, and was pulled down within the memory of ſome perſons lately or perhaps ſtill living. Beſides theſe, there was a third, about 50 yards above the head of the Canongate; but whether there were any more, is uncertain. The ports or gates of the new walls were, 1. The *Weſt-port*, ſituated at the extremity of the Graſs-market; beyond which lies a ſuburb of the town and a borough of regality, called *Portſburgh*. Next to this is a wicket, ſtruck out of the town-wall in 1744, for the purpoſe of making an eaſier communication between the town and the public walks in the meadows, than by Briſto-port. The next to this was *Briſto-port*, built in 1515; beyond which lies a ſuburb called *Briſto-ſtreet*. At a ſmall diſtance from Briſto was the *Potter-row Port*, which took this name from a manufactory of earthen ware in the neighbourhood. Formerly it was called *Kirk of*

Field Port. Between this and the Cowgate-port ſtood another, called *St Mary's Wynd Port*, which extended from eaſt to weſt acroſs the foot of the Pleaſance, and which was demoliſhed only ſince the middle of the laſt century.—Cloſe to the middle of this ſtood the *Cowgate-port*; which opened a communication between the Cowgate and St Mary's wynd, and the Pleaſance.—The *Nether-bow Port* has been already ſpoken of.—At the foot of Leith-wynd was another gate, known by the name of *Leith-wynd Port*; and within it was a wicket giving acceſs to the church of Trinity College, and which ſtill remains. At the foot of Halkerſton's wynd was another, which, as well as the former, was built about the year 1560. Both of theſe were pulled down ſome years ago, and all the reſt in 1785.—Another ſtill remains at the foot of the Canongate, known by the name of the *Water-gate*.

For 250 years the city of Edinburgh occupied the ſame ſpace of ground, and it is but very lately that its limits have been ſo conſiderably enlarged. In the middle of the 16th century, it is deſcribed as extending in length about an Italian mile, and about half as much in breadth; which anſwers very nearly to its preſent limits, the late enlargements only excepted.—This ſpace of ground, however, was not at that time occupied in the manner it is at preſent. The houſes were neither ſo high nor ſo crowded upon each other as they are now. This was a conſequence of the number of inhabitants increaſing, which has occaſioned the raiſing of the houſes to ſuch an height as is perhaps not to be paralleled in any other part of the world. Till the time of the Reformation, the burying ground of the city extended over all the ſpace occupied by the Parliament-ſquare, and from thence to the Cowgate. The lands lying to the ſouthward of the Cowgate were chiefly laid out in gardens belonging to the convent of Black-friars, and the church of St Mary in the Field. Theſe extended almoſt from the Pleaſance to the Potterrow-port. From the Briſto to the Weſt-Port, the ground was laid out in gardens belonging to the Gray-friars. The magiſtrates, on their application to queen Mary, obtained a grant of the Gray-friars gardens for a burying-place; for which it was given as a reaſon, that they were ſomewhat diſtant from the town. Here, however, it muſt be underſtood, that theſe gardens were diſtant from the houſes, and not without the walls; for they had been incloſed by them long before.—In the time of James I. the houſes within the walls ſeem to have been in general, if not univerſally, covered with thatch or broom; and not above 20 feet high. Even in the year 1621, theſe roofs were ſo common, that they were prohibited by act of parliament, in order to prevents accident from fire.—In the middle of the laſt century, there were neither courts nor ſquares in Edinburgh. The Parliament cloſe or ſquare is the oldeſt of this kind in the city. Miln's ſquare, James's court, &c. were built long after; and Argyle's and Brown's ſquares within theſe 50 years.

27 New Town. The *New Town* was projected in the year 1752; but as the magiſtrates could not then procure an extenſion of the royalty, the execution of the deſign was ſuſpended for ſome time. In 1767, an act was obtained, by which the royalty was extended over the fields to the northward of the city; upon which advertiſements were publiſhed by the magiſtrates, deſiring proper plans to be given in. Plans were given in accordingly, and that deſigned by Mr James Craig architect was adopted. Immediately afterwards, people were invited to purchaſe lots from the town-council; and ſuch as purchaſed became bound to conform to the rules of the plan. In the mean time, however, the town-council had ſecretly reſerved to themſelves a privilege of departing from their own plan; which they afterwards made uſe of in ſuch a manner as produced a law-ſuit. According to the plan held forth to the purchaſers, a canal was to be made through that place where the north loch had been, and the bank on the north ſide of it laid out in terraces: but inſtead of this, by an act of council, liberty was reſerved to the town to build upon this ſpot; and therefore, when many gentlemen had built genteel houſes in the new town on faith of the plan, they were ſurpriſed to find the ſpot appointed for terraces and a canal, beginning to be covered with mean irregular buildings, and work-houſes for tradeſmen. This deviation was immediately complained of; but as the magiſtrates ſhowed no inclination to grant any redreſs, a proſecution was commenced againſt them before the Lords of Seſſion. In that court the cauſe was given againſt the purſuers, who thereupon appealed to the Houſe of Lords. Here the ſentence of the Court of Seſſion was reverſed, and the cauſe remitted to the conſideration of their Lordſhips. At laſt, after an expenſive conteſt, matters were accommodated. The principal term of accommodation was, that ſome part of the ground was to be laid out in terraces and a canal; but the time of diſpoſing it in that manner, was referred to the Lord Preſident of the Court of Seſſion and the Lord Chief Baron of the Exchequer.—The fall of part of the bridge, hereafter mentioned, proved a very conſiderable diſadvantage to the new town; as it neceſſarily induced a ſuſpicion that the paſſage, by means of the bridge, could never be rendered ſafe. An overſight of the magiſtrates proved of more eſſential detriment. A piece of ground lay to the ſouthward of the old town, in a ſituation very proper for building. This the magiſtrates had an opportunity of purchaſing for 1200l; which, however, they neglected, and it was bought by a private perſon, who immediately feued it out in lots for building, as has been already mentioned. The magiſtrates then began to ſee the conſequence, namely, that this ſpot being free from the duties to which the royalty of Edinburgh is ſubject, people would chooſe to reſide there rather than in the New Town. Upon this they offered the purchaſer 2000l. for the ground for which he had paid 1200l.; but as he demanded 20,000l. the bargain did not take place. Notwithſtanding theſe diſcouragements, the New Town is now almoſt finiſhed; and from the advantages of its ſituation, and its being built according to a regular plan, it hath undoubtedly a ſuperiority over any city in Britain. By its ſituation, however, it is remarkably expoſed to ſtorms of wind, which, at Edinburgh, ſometimes rage with uncommon violence.

It has three ſtreets, almoſt a mile in length, running from eaſt to weſt, interſected with croſs ſtreets at proper diſtances. The moſt northerly, called *Queen's Street*, is 100 feet broad, and commands an extenſive proſpect of the Forth, the county of Fife, and the ſhipping in the river. That called *George's Street*, which is in the middle, is no leſs than 115 feet wide. It is terminated at each end by two very elegant and extenſive ſquares; that on the eaſt end is called *St Andrew's Square*; the other, tho' not yet finiſhed, nor indeed begun, is to be named *Charlotte's Square*. Prince's ſtreet is the moſt ſoutherly; and extends from the northern extremity of the bridge, quite to the weſt end of the town; though as that is not yet finiſhed, we cannot ſay whether it will be done exactly according to the plan laid down, as there has been a propoſal made by a private perſon of continuing the whole a conſiderable way farther to the weſtward, to end in a circus. The reaſon given for this propoſed innovation is, that the road to Glaſgow and other parts in the weſt will thus be rendered more eaſy, as it will then lie along the new bridge over the Water of Leith at Bell's mills, which is much more convenient than that juſt now in uſe.

The moſt remarkable public buildings in Edinburgh are:

28 Public buildings deſcribed.

1. *The Caſtle.* This ſtands on a high rock, acceſſible only on the eaſt ſide. On all others it is very ſteep, and in ſome places perpendicular. It is about 300 feet high from its baſe: ſo that, before the invention of artillery, it might well have been deemed impregnable; though the event ſhowed that it was not.—The entry to this fortreſs is defended by an outer barrier of palliſadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by an half-moon mounted with braſs cannon, carrying balls of 12 pounds. Beyond theſe are two gate-ways, the firſt of which is very ſtrong, and has two portculliſes. Immediately beyond the ſecond gate-way, on the right hand, is a battery mounted with braſs cannon, carrying balls of 12 and 18 pounds weight. On the north ſide are a mortar and ſome gun batteries.—The upper part of the caſtle contains a half-moon battery, a chapel, a parade for exerciſe, and a number of houſes in the form of a ſquare, which are laid out in baracks for the officers. Beſides theſe there are other baracks ſufficient to contain 1000 men; a powder magazine bomb-proof; a grand arſenal, capable of containing 8000 ſtand of arms; and other apartments for the ſame uſe, which can contain 22,000 more: ſo that 30,000 ſtand of arms may be conveniently lodged in this caſtle.—On the eaſt ſide of the ſquare above mentioned, were formerly royal apartments; in one of which king James VI. was born, and which is ſtill ſhown to thoſe who viſit the caſtle. In another, the regalia of Scotland were depoſited on the 26th of March 1707, and are ſaid to be ſtill kept there; but they are never ſhown to any body. Hence a ſuſpicion has ariſen that they have been carried to London; which is the more confirmed, as the keeper of the jewel-office in the tower of London ſhows a crown, which he calls that of Scotland; and it is certain that the door of what is called the *Crown-room* has not been publicly known to be opened ſince the union.

The governor of the caſtle is generally a nobleman, whoſe place is worth about 1000l. a-year; and that of deputy-governor, 500l. This laſt reſides in the houſe appointed for the governor, as the latter never inhabits it. There is alſo a fort-major, a ſtore-keeper, maſter gunner, and chaplain; but as this laſt does not reſide in the caſtle, worſhip is ſeldom performed in the chapel. The parliament-houſe was formerly included in the great ſquare on the top, and the royal gardens were in the marſh afterwards called the *North-loch*; the king's ſtables being on the ſouth ſide, where the houſes ſtill retain the name, and the place where the barns were ſtill retain the name of Caſtle-barns.

The caſtle is defended by a company of invalids, and four or five hundred men belonging to ſome marching regiment, though it can accommodate 1000, as abovementioned; and this number has been ſometimes kept in it. Its natural ſtrength of ſituation was not ſufficient to render it impregnable, even before the invention of artillery, as we have already obſerved; much leſs would it be capable of ſecuring it againſt the attacks of a modern army well provided with cannon. It could not, in all probability, withſtand, even for a few hours, a well directed bombardment: for no part but the powder-magazine is capable of reſiſting theſe deſtructive machines; and the ſplinters from the rock on which the caſtle is built, could not fail to render them ſtill more formidable. Beſides, the water of the well, which is very bad, and drawn up from a depth of 100 feet, is apt to ſubſide on the continued diſcharge of artillery, which produces a concuſſion in the rock.

2. *The Palace of Holyrood-houſe.* This, though much neglected, is the only royal habitation in Scotland that is not entirely in ruins. It is a handſome ſquare of 230 feet in the inſide, ſurrounded with piazzas. The front, facing the weſt, conſiſts of two double towers joined by a beautiful low building, adorned with a double baluſtrade above. The gateway in the middle is decorated with double ſtone columns, ſupporting a cupola in the middle, repreſenting an imperial crown, with a clock underneath. On the right hand is the great ſtaircaſe which leads to the council chamber and the royal apartments. Theſe are large and ſpacious, but unfurniſhed: in one of them the Scotch peers meet to elect 16 of their number to repreſent them in parliament. The gallery is on the left hand, and meaſures 150 feet by 27½. It is adorned with the ſuppoſed portraits of all the kings of Scotland. In the apartments of the duke of Hamilton, which he poſſeſſes as hereditary keeper of the palace, queen Mary's bed of crimſon damaſk, bordered with green fringes and taſſels, is ſtill to be ſeen, but almoſt reduced to rags. Here alſo ſtrangers are ſhown a piece of wainſcot hung upon hinges, which opens to a trap-ſtair communicating with the apartments below. Through this paſſage Darnley and the other conſpirators ruſhed in to murder the unhappy Rizzio. Towards the outward door of theſe apartments are large duſky ſpots on the floor, ſaid to be occaſioned by Rizzio's blood, which could never be waſhed out. In the lodgings aſſigned to lord Dunmore is a picture by Van Dyke, eſteemed a maſterly performance, of king Charles I. and his queen going a-hunting. There are likewiſe the portraits of their preſent majeſties at full length by Ramſay. The lodgings above the royal apartments are occupied by the duke of Argyle as heritable maſter of the houſehold.

The front of this palace is two ſtories high; the roof flat; but at each end the front projects, and is ornamented with circular towers at the angles. Here the building is much higher, and the reſt of the palace is three ſtories in height. The north-weſt towers were built by James V. for his own reſidence: his name is ſtill to be ſeen below a nitch in one of theſe towers. During the minority of queen Mary, this palace was burned by the Engliſh; but ſoon after repaired and enlarged beyond its preſent ſize. At that time it conſiſted of five courts, the moſt weſterly of which was the largeſt. It was bounded on the eaſt by the front of the palace, which occupied the ſame ſpace it does at preſent; but the building itſelf extended further to the ſouth. At the north-weſt corner was a ſtrong gate, with Gothic pillars, arches, and towers, part of which was not long ago pulled down. Great part of the palace was burnt by Cromwell's ſoldiers; but it was repaired and altered into the preſent form after the Reſtoration. The fabric was planned by Sir William Bruce a celebrated architect, and executed by Robert Mylne maſon. The environs of the palace afford an aſylum for inſolvent debtors; and adjoining to it is an extenſive park, all of which is a ſanctuary.

The abbey church was formerly called the *monaſtery of Holyrood-houſe*, and built by king David I. in 1128. He gave it the name of *Holyrood-houſe*, in memory, as is ſaid, of his deliverance from an enraged hart, by the miraculous interpoſition of a croſs from heaven. This monaſtery he gave to the canons regular of St Auguſtine: on whom he alſo beſtowed the church of Edinburgh caſtle, with thoſe of St Cuthbert's, Corſtorphin, and Libberton, in the ſhire of Mid-Lothian, and of Airth in Stirlingſhire; the priories of St Mary's iſle in Galloway, of Blantyre in Clydeſdale, of Rowadill in Roſs, and three others in the Weſtern Iſles. To them he alſo granted the privilege of erecting a borough between the town of Edinburgh and the church of Holyrood-houſe. From theſe canons it had the name of the *Canongate*, which it ſtill retains. In this new borough they had a right to hold markets. They had alſo portions of land in different parts, with a moſt extenſive juriſdiction, and right of trial by duel, and fire and water ordeal. They had alſo certain revenues payable out of the exchequer and other funds, with fiſhings, and the privilege of erecting mills on the water of Leith, which ſtill retain the name of *Canon-mills*. Other grants and privileges were beſtowed by ſucceeding ſovereigns; ſo that it was deemed the richeſt religious foundation in Scotland. At the Reformation, its annual revenues were, 442 bolls of wheat, 640 bolls of bear, 560 bolls of oats, 500 capons, two dozen of hens, as many ſalmon, 12 loads of ſalt; beſides a great number of ſwine, and about 250 l. ſterling in money. At the Reformation, the ſuperiority of North Leith, part of the Pleaſance, the barony of Broughton, and the Canongate, was veſted in the earl of Roxburgh; and were purchaſed from him by the town-council of Edinburgh in 1636. In 1544, the church ſuffered conſiderably by the invaſion of the Engliſh; but was ſpeedily repaired. At the Reſtoration, king Charles II. ordered the church to be ſet apart as a chapel-royal, and prohibited its uſe as a common pariſh church for the future. It was then fitted up in a very elegant manner. A throne was erected for the ſovereign, and 12 ſtalls for the knights of the order of the thiſtle: but as maſs had been celebrated in it in the reign of James VII. and it had an organ, with a ſpire, and a fine chime of bells on the weſt ſide, the Preſbyterians at the revolution entirely deſtroyed its ornaments, and left nothing but the bare walls.—Through time, the roof of the church became ruinous; on which the duke of Hamilton repreſented its condition to the barons of exchequer, and craved that it might be repaired. This requeſt was complied with: but the architect and maſon who were employed, covered the roof with thick flag-ſtones, which ſoon impaired the fabric; and on the 2d of December 1768, the roof fell in. Since that time, no attempt has been made to repair it, and it is now entirely fallen to ruin.

The ruins of this church, however, are ſtill ſufficient to diſcover the excellency of the workmanſhip. Here ſome of the king's of Scotland are interred; and an odd kind of curioſity has been the occaſion of expoſing ſome bones ſaid to be thoſe of lord Darnley and a counteſs of Roxburgh who died ſeveral hundred years ago. Thoſe ſaid to belong to the former were very large, and the latter had ſome fleſh dried upon them. The chapel was fitted up in the elegant manner above mentioned by James VII. but ſuch was the enthuſiaſm of the mob, that they not only deſtroyed the ornaments, but tore up even the pavement, which was of marble.

To the eaſtward of the palace is the bowling-green, now entirely in diſorder; and behind it is a field called *St Ann's Yards*. Beyond this is a piece of ground called *the King's Park*; which undoubtedly was formerly overgrown with wood, though now there is not a ſingle tree in it. It is about three miles in circumference; and was firſt incloſed by James V. It contains the rocky hills of *Arthur's Seat* and Saliſbury Craigs, which laſt afford an inexhauſtible ſtone quarry; and upon the north ſide of the hill ſtands an old ruinous chapel, dedicated to St Anthony. The ſtones are uſed in building, as well as for paving the ſtreets and high-ways. The park was mortgaged to the family of Haddington for a debt due to them; and by the preſent earl has been divided into a number of incloſures by ſtone-dykes raiſed at a conſiderable expence. A good number of ſheep and ſome black cattle are fed upon it; and it is now rented at 1500 l. annually.

3. *St Giles's Church* is a beautiful Gothic building, meaſuring in length 206 feet. At the weſt end, its breadth is 110; in the middle, 129; and at the eaſt end, 76 feet. It has a very elevated ſituation, and is adorned with a lofty ſquare tower; from the ſides and corners of which riſe arches of figured ſtonework: theſe meeting with each other in the middle, complete the figure of an imperial crown, the top of which terminates in a pointed ſpire. The whole height of this tower is 161 feet.

This is the moſt ancient church in Edinburgh. From a paſſage in an old author called *Simeon Dunelmenſis*, ſome conjecture it to have been built before the year 854; but we do not find expreſs mention made of it before 1359. The tutelar ſaint of this church, and of Edinburgh, was St Giles, a native of Greece. He lived in the ſixth century, and was deſcended of an illuſtrious family. On the death of his parents, he gave all his eſtate to the poor; and travelled into France, where he retired into a wilderneſs near the conflux of the Rhone with the ſea, and continued there three years. Having obtained the reputation of extraordinary ſanctity, various miracles were attributed to him; and he founded a monaſtery in Languedoc, known long after by the name of *St Giles's.*—In the reign of James II. Mr Preſton of Gorton, a gentleman whoſe deſcendents ſtill poſſeſs an eſtate in the county of Edinburgh, got poſſeſſion of the arm of this ſaint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magiſtrates granted a charter in favour of Mr Preſton's heirs, by which the neareſt heir of the name of Preſton was entitled to carry it in all proceſſions. At the ſame time, the magiſtrates obliged themſelves to found an altar in the church of St Giles's, and appoint a chaplain for celebrating an annual maſs for the ſoul of Mr Preſton; and likewiſe, that a tablet, containing his arms, and an account of his pious donation, ſhould be put up in the chapel.—St Giles's was firſt ſimply a pariſh-church, of which the biſhop of Lindisfarn or Holy Iſland, in the county of Northumberland, was patron. He was ſucceeded in the patronage by the abbot and canons of Dunfermline, and they by the magiſtrates of Edinburgh. In 1466, it was erected into a collegiate church by James III.—At the Reformation, the church was, for the greater convenience, divided into ſeveral parts. The four principal ones are appropriated to divine worſhip, the leſſer ones to other purpoſes. At the ſame time the religious utenſils belonging to this church were ſeized by the magiſtrates. They were,—St Giles's arm, enſhrined in ſilver, weighing five pounds three ounces and an half; a ſilver chalice, or communion-cup, weighing 23 ounces; the great *euchariſt* or communion-cup, with *golden weike and ſtones;* two cruets of 25 ounces; a golden bell, with a heart, of four ounces and a half; a golden unicorn; a golden pix, to keep the hoſt; a ſmall golden heart, with two pearls; a diamond ring; a ſilver chalice, patine, and ſpoon, of 32 ounces and a half: a communion-table-cloth of gold brocade; *St Giles's coat,* with a little piece of red velvet which hung at his feet; a round ſilver *euchariſt:* two ſilver cenſers, of three pounds fifteen ounces; a ſilver ſhip for incenſe; a large ſilver croſs, with its baſe, weighing ſixteen pounds thirteen ounces and a half; a triangular ſilver lamp; two ſilver candleſticks, of ſeven pounds three ounces; other two, of eight pounds thirteen ounces; a ſilver chalice gilt, of 20½ ounces; a ſilver chalice and croſs, of 75 ounces; beſides the prieſts robes, and other veſtments, of gold brocade, crimſon velvet embroidered with gold, and green damaſk.—Theſe were all ſold, and part of the money applied to the repairs of the church; the reſt was added to the funds of the corporation.

In the ſteeple of St Giles's church are three large bells brought from Holland in 1621; the biggeſt weighing 2000 lb. the ſecond 700, and the third 500. There are alſo a ſet of muſic bells, which play every day between one and two o'clock, or at any time in the caſe of rejoicings. The principal diviſion is called the *High Church,* and has been lately repaired and new ſeated. There is a very elegant and finely ornamented ſeat for his majeſty, with a canopy ſupported by four Corinthian pillars decorated in high taſte. This ſeat is uſed by the king's commiſſioner during the time the General Aſſembly ſits. On the right hand is a ſeat for the lord high conſtable of Scotland, whoſe office it is to keep the peace within doors in his majeſty's preſence; it being the duty of the earl marſhal to do the ſame without. The ſeats belonging to the lords of council and ſeſſion are on the right of the lord high conſtable; and on the left of the throne was a ſeat for the lord high chancellor of Scotland; but that office being now aboliſhed, the ſeat is occupied by others. On the left of this ſit the barons of exchequer; and, to the left of them, the lord provoſt, magiſtrates, and town-council. The pulpit, king's ſeat, and galleries, are covered with crimſon velvet with gold and ſilk fringes.

The aiſle of St Giles's church is fitted up with ſeats for the general aſſembly who meet here; and there is a throne for his majeſty's commiſſioner with a canopy of crimſon ſilk damaſk, having the king's arms embroidered with gold, preſented by the late lord Cathcart to his ſucceſſor in office. In this church is a monument dedicated to the memory of lord Napier, baron of Merchiſton, well known as the inventor of logarithms; a ſecond to the earl of Murray, regent of Scotland during the minority of James VI.; and a third to the great marquis of Montroſe.

4. *The Parliament Houſe,* in the great hall of which the Scottiſh parliament uſed to aſſemble, is a magnificent building. The hall is 123 feet long and 42 broad, with a fine arched roof of oak, painted and gilded. In this the lawyers and agents now attend the courts, and ſingle judges ſit to determine cauſes in the firſt inſtance, or to prepare them for the whole court, who ſit in an inner room formerly appropriated to the privy-council. In a nich of the wall is placed a fine marble ſtatue of preſident Forbes, erected at the expence of the faculty of advocates. There are alſo full length portraits of king William III. queen Mary his conſort, and queen Anne, all done by Sir Godfrey Kneller; alſo of George I. John duke of Argyle, and Archibald duke of Argyle, by Mr Aikman of Cairney.

Above ſtairs are the court of exchequer and treaſury chamber, with the different offices belonging to that department; and below is one of the moſt valuable libraries in Great Britain, belonging to the faculty of advocates. Beſides 30,000 printed volumes, there are many ſcarce and valuable manuſcripts, medals, and coins: there is alſo an entire mummy in its original cheſt, preſented to the faculty (at the expence of 300 l.) by the earl of Morton, late preſident of the royal ſociety. As theſe rooms are immediately below the hall where the parliament ſat, they are ſubject to a ſearch by the lord high conſtable of Scotland ever ſince the gun-powder plot; and this is ſpecified in the gift from the city to the faculty. This library was founded, in the year 1682, by Sir George Mackenzie lord advocate. Among other privileges, it is intitled to a copy of every book entered in ſtationer's hall. Before the great door is a noble equeſtrian ſtatue of Ch. II. the proportions of which are reckoned exceedingly juſt. Over the entrance are the arms of Scotland, with Mercy and Truth on each ſide for ſupporters.

The court of ſeſſion, the ſupreme tribunal in Scotland, conſiſts of 15 judges, who ſit on a circular bench, clothed in purple robes turned up with crimſon velvet. Six of theſe are lords of the juſticiary, and go the circuit twice a-year; but, in that capacity, they wear ſcarlet robes turned up with white ſattin.

5. *The Tolbooth* was erected in 1561, not for the purpoſes merely of a priſon, but likewiſe for the accommodation of the parliament and other courts; but it has ſince become ſo very unfit for any of theſe purpoſes, that it is now propoſed to pull it down and rebuild it in ſome other place, eſpecially as it is very inconvenient in its preſent ſituation on account of its incumbering the ſtreet. The provoſt is captain of the tolbooth, with a gaoler under him: and the latter has a monopoly of all the proviſions for the priſoners; a circumſtance which muſt certainly be conſidered as a grievous oppreſſion, thoſe who are leaſt able to purchaſe them being thus obliged to do ſo at the higheſt price. There is a chaplain who has a ſalary of 30l. a-year.

6. There is a Hall in the Writers Court belonging to the clerks to his majeſty's ſignet, where there is alſo an office for the buſineſs of the ſignet. The office of keeper of the ſignet is very lucrative, and he is allowed a depute and clerks under him. Before any one enters into this ſociety he muſt attend the college for two years, and ſerve five years as an apprentice to one of the ſociety. There is a good library belonging to this hall, which is rapidly increaſing, as every one who enters muſt pay 10 l. towards it. He pays alſo 100 l. of apprentice-fee, and 100l. when he enters.

7. *The Exchange* is a large and elegant building, with a court of about 90 feet ſquare in the middle. On the north ſide are piazzas where people can walk under cover, the other three ſides being laid out in ſhops; but the merchants have never made uſe of it to meet in, ſtill ſtanding in the ſtreet as formerly. The back part of the building is uſed for the general cuſtom-houſe of Scotland, where the commiſſioners meet to tranſact buſineſs. They have above 20 offices for the different departments, to which the acceſs is by a hanging ſtair 60 feet in height. In looking over the window before he aſcends this ſtair, a ſtranger is ſurpriſed to find himſelf already 40 feet from the ground, which is owing to the declivity on which the exchange is built. For the cuſtomhouſe rooms the city receives a rent of 1l. *per* day.

The Truſtees Office for the improvement of fiſheries and manufactures in Scotland is in the ſouth-weſt corner of the exchange; the fund under their management being part of the equivalent money given to Scotland at the Union. This is diſtributed in premiums amongſt thoſe who appear to have made any conſiderable improvement in the arts.

7. *The North Bridge*, which forms the main paſſage of communication betwixt the Old and New Towns, was founded, as has already been obſerved, in 1763 by Provoſt Drummond; but the contract for building it was not ſigned till Auguſt 21ſt 1765. The architect was Mr William Mylne, who agreed with the town-council of Edinburgh to finiſh the work for 10,140 l. and to uphold it for 10 years. It was alſo to be finiſhed before Martinmas 1769: but on the 3d of Auguſt that year, when the work was nearly completed, the vaults and ſide-walls on the ſouth fell down, and five people were buried in the ruins. This misfortune was occaſioned by the foundation having been laid, not upon the ſolid earth, but upon the rubbiſh of the houſes which had long before been built on the north ſide of the high-ſtreet, and which had been thrown out into the hollow to the northward. Of this rubbiſh there were no leſs than eight feet between the foundation of the bridge and the ſolid earth. Beſides this deficiency in the foundation, an immenſe load of earth which had been laid over the vaults and arches in order to raiſe the bridge to a proper level, had no doubt contributed to produce the cataſtrophe above mentioned.—The bridge was repaired, by pulling down ſome parts of the ſide-walls, and afterwards rebuilding them; ſtrengthening them in others with chain-bars; removing the quantity of earth laid upon the vaults, and ſupplying its place with hollow arches, &c. The whole was ſupported at the ſouth end by very ſtrong buttreſſes and counterforts on each ſide; but on the north it has only a ſingle ſupport.—The whole length of the bridge, from the High-ſtreet in the Old Town to Prince's-ſtreet in the New, is 1125 feet; the total length of the piers and arches is 310 feet. The width of the three great arches is 72 feet each; of the piers, 13½ feet; and of the ſmall arches, each 20 feet. The height of the great arches, from the top of the parapet to the baſe, is 68 feet; the breadth of the bridge within the wall over the arches is 40 feet, and the breadth at each end 50 feet.—On the ſouthern extremity of this bridge ſtands the General Poſt Office for Scotland; a neat plain building, with a proper number of apartments for the buſineſs, and a houſe for the ſecretary.

The communication betwixt the two towns by means of this bridge, though very complete and convenient for ſuch as lived in certain parts of either, was yet found inſufficient for thoſe who inhabited the weſtern diſtricts. Another bridge being therefore neceſſary, it was propoſed to fill up the valley occaſionally with the rubbiſh dug out in making the foundations of houſes in the New Town; and ſo great was the quantity, that this was accompliſhed ſo as to be fit for the paſſage of carriages in little more than four years and an half.

8. *The South Bridge* is directly oppoſite to the other, ſo as to make but one ſtreet, croſſing that called the *High-ſtreet* almoſt at right angles. It conſiſts of 19 arches of different ſizes: but only one of them is viſible, *viz.* the large one over the Cowgate; and even this is ſmall in compariſon with thoſe of the North Bridge, being no more than 30 feet wide and 31 feet high. On the ſouth it terminates at the Univerſity on one hand, and the Royal Infirmary on the other. The Tron Church, properly called *Chriſt Church*, ſtands at the northern extremity, facing the High-ſtreet, and in the middle of what is now called *Hunter's Square*, in memory of the late worthy chief magiſtrate who planned theſe improvements, but did not live to ſee them executed. On the weſt ſide of this ſquare the Merchant Company have built a very handſome hall for the occaſional meetings of their members. This bridge was erected with a deſign to give an eaſy acceſs to the great number of ſtreets and ſquares on the ſouth ſide, as well as to the country on that quarter from whence the city is ſupplied with coals. The ſtreet on the top is ſuppoſed to be as regular as any in Europe; every houſe being of the ſame dimenſions, excepting that between every two of the ordinary conſtruction there is one with a pediment on the top, in order to prevent

that ſameneſs of appearance which would otherwiſe take place. So great was the rage for purchaſing ground on each ſide of this bridge for building, that the areas ſold by public auction at 50l. *per* foot in front. By this the community will undoubtedly be conſiderable gainers; and the proprietors hope to indemnify themſelves for their extraordinary expence by the vaſt ſale of goods ſuppoſed to attend the ſhops in that part of the town; though this ſeems ſomewhat more dubious than the former.

9. *The Concert Hall*, called alſo *St Cecilia's Hall*, ſtands in Niddery's-ſtreet; and was built in 1762, after the model of the great opera-theatre in Parma. The plan was drawn by Sir Robert Mylne, architect of Blackfriars bridge. The muſical room is of an oval form, the ceiling being a concave elliptical dome, lighted from the top by a lanthorn. The ſeats are ranged in the form of an amphitheatre; and are capable of containing 500 perſons, beſides leaving a large area in the middle of the room. The orcheſtra is at the upper end, and is terminated by an elegant organ.

The muſical ſociety was firſt inſtituted in the year 1728. Before that time, ſeveral gentlemen had formed a weekly club at a tavern kept by one Steil, a great lover of muſic, and a good ſinger of Scots ſongs. Here the common entertainment conſiſted in playing on the harpſichord and violin the concertos and ſonatas of Handel, juſt then publiſhed. The meeting, however, ſoon becoming numerous, they inſtituted, in the year above mentioned, a ſociety of 70 members, for the purpoſe of holding a weekly concert. The affairs of the ſociety are regulated by a governor, deputy-governor, treaſurer, and five directors, who are annually choſen by the members. The meetings have been continued ever ſince that time on much the ſame footing as at firſt, and the number of members is now increaſed to 200. The weekly concerts are on Friday; the tickets being given gratis by the directors, and attention paid in the firſt place to ſtrangers. Oratorios are occaſionally performed throughout the year; and the principal performers have alſo benefit concerts. The band are excellent in their ſeveral departments; and ſeveral of the members are alſo good performers, and take their part in the orcheſtra. There are always many applications on the occaſion of a vacancy by the death of any of the members or otherwiſe; and ſuch is generally the number of candidates, that it is no eaſy matter to get in.

10. *The Univerſity*. In the year 1581, a grant was obtained from king James VI. for founding a college or univerſity within the city of Edinburgh; and the citizens, aided by various donations from well diſpoſed perſons, purchaſed a ſituation for the intended new college, conſiſting of part of the areas, chambers, and church of the collegiate provoſtry and prebends of the Kirk-a-field, otherwiſe called *Templum et Præfectura Sanctæ Mariæ in campis*, lying on the ſouth ſide of the city. Next year, a charter of confirmation and erection was obtained alſo from king James VI. from which the college to be built did afterwards derive all the privileges of an univerſity.

In 1583, the provoſt, magiſtrates, and council, the patrons of this new inſtitution, prepared the place in the beſt manner they could for the reception of teachers and ſtudents; and in the month of October the ſame year, Robert Rollock, whom they had invited from a profeſſorſhip in St Salvator's College in the univerſity of St Andrew's, began to teach in the new college of Edinburgh. Other profeſſors were ſoon after elected; and in the year 1586, Rollock was appointed principal of the college, and the following year alſo profeſſor of divinity, immediately after he had conferred the degree of M. A. on the ſtudents who had been under his tuition for four years. The offices of principal and profeſſor of divinity remained united till the year 1620.

In the 1617, king James VI. having viſited Scotland after his acceſſion to the crown of England, commanded the principal and regents of the college of Edinburgh to attend him in Stirling caſtle; and after they had there held a ſolemn philoſophical diſputation in the royal preſence, his majeſty was ſo much ſatiſfied with their appearance, that he deſired their college for the future might be called *The College of King James*, which name it ſtill bears in all its diplomas or public deeds.

For ſeveral years the college conſiſted only of a principal, who was alſo profeſſor of divinity, with four regents or profeſſors of philoſophy. Each of theſe regents inſtructed one claſs of ſtudents for four years, in Latin, Greek, ſchool logic, mathematics, ethics, and phyſics, and graduated them at the concluſion of the fourth courſe. A profeſſor of humanity or Latin was afterwards appointed, who prepared the ſtudents for entering under the tuition of the regents; alſo a profeſſor of mathematics, and a profeſſor of Hebrew or Oriental languages. It was not till about the year 1710 that the four regents began to be confined each to a particular profeſſion; ſince which time they have been commonly ſtyled *Profeſſors of Greek, Logic, Moral, Philoſophy, and Natural Philoſophy*.—The firſt medical profeſſors inſtituted at Edinburgh, were Sir Robert Sibbald and Doctor Archibald Pitcairn, in the year 1685*. Theſe, however, were only titular profeſſors; and for 30 years afterwards, a ſummer-lecture on the officinal plants, and the diſſection of a human body once in two or three years, completed the whole courſe of medical education at Edinburgh.—In 1720, an attempt was made to teach the different branches of phyſic regularly; which ſucceeded ſo well, that, ever ſince, the reputation of the univerſity as a ſchool for medicine hath been conſtantly increaſing, both in the iſland of Britain, and even among diſtant nations.

The college is endowed with a very fine library, founded in 1580 by Mr Clement Little advocate, who bequeathed it to the town-council. They ordered a houſe to be built for it in the neighbourhood of St Giles's church, where it was for ſome time kept under the care of the eldeſt miniſter of Edinburgh, but was afterwards removed to the college. This collection is enriched, as well as others of a ſimilar kind, by receiving a copy of every book entered in Stationer's hall, according to the ſtatute for the encouragement of authors. Beſides this, the only fund it has is the money paid by all the ſtudents at the univerſity, except thoſe of divinity, upon their being matriculated; and a ſum of 5l. given by each profeſſor at his admiſſion. The amount of theſe ſums is uncertain, but has been eſtimated at about 150l. annually. The ſtudents

* See College of Phyſicians.

of divinity, who pay nothing to this library, have one belonging to their own particular department.

Here are ſhown two ſkulls, one almoſt as thin as paper, pretended to be that of the celebrated George Buchanan, and, by way of contraſt, another ſaid to have been that of an idiot, and which is exceſſively thick. Here alſo are preſerved the original proteſt againſt the council of Conſtance for burning John Huſs and Jerom of Prague in 1417; the original contract of queen Mary with the dauphin of France, and ſome valuable coins and medals. There are alſo ſeveral portraits; particularly of Robert Pollock the firſt principal of the univerſity, king James VI. Lord Napier the inventor of logarithms, John Knox, principal Carſtairs, Mr Thomſon the author of the Seaſons, &c. The muſeum contains a good collection of natural curioſities, the number of which is daily increaſing. The anatomical preparations are worth notice, as are alſo thoſe belonging to the profeſſor of midwifery.

The celebrity of this college has been greatly owing to the uniform attention of the magiſtracy in filling up the vacant chairs with men of known abilities in their reſpective departments. Greatly to their honour, too, they have been no leſs attentive to the inſtituting of new profeſſorſhips from time to time as the public ſeemed to demand them. At preſent (anno 1790), the Senatus Academicus conſiſts of the following members, arranged according to the different faculties.

Faculty of THEOLOGY.

William Robertſon, D. D. Principal of the College.
Andrew Hunter, D. D. Profeſſor of Divinity.
Thomas Hardy, D. D. Regius Profeſſor of Church-Hiſtory.
James Robertſon, D. D. Profeſſor of Oriental Languages, and Emeritus Secretary and Librarian.

Faculty of LAW.

Robert Dick, Advocate, Profeſſor of Civil Law.
Allan Maconochie, Advocate, Profeſſor of Public Law.
Alexander Fraſer Tytler, Advocate, Profeſſor of Univerſal Civil Hiſtory, and of Greek and Roman Antiquities.
David Hume, Advocate, Profeſſor of Scots Law.

Faculty of MEDICINE.

Alexander Monro, M. D. Profeſſor of Medicine, and of Anatomy and Surgery.
James Gregory, M. D. Profeſſor of the Practice of Phyſic.
Joſeph Black, M. D. Profeſſor of Medicine and Chemiſtry.
Francis Home, M. D. Profeſſor of Medicine and Materia Medica.
Andrew Duncan, M. D. Profeſſor of the Theory of Phyſic.
Daniel Rutherford, M. D. Profeſſor of Medicine and Botany.
Alexander Hamilton, M. D. Profeſſor of Midwifery.

Faculty of ARTS.

George Stewart, LL. D. Emeritus Profeſſor of Humanity.
Adam Ferguſſon, LL. D. Emeritus Profeſſor of Moral Philoſophy, and joint Profeſſor of Mathematics.
Hugh Blair, D. D. Emeritus Profeſſor of Rhetoric and Belles Lettres.
Andrew Dalziel, A. M. Profeſſor of Greek, and Secretary and Librarian.
John Robiſon, A. M. Profeſſor of Natural Philoſophy.
Dugald Stewart, A. M. Profeſſor of Moral Philoſophy.
John Hill, LL. D. Profeſſor of Humanity.
John Bruce, A. M. Joint Profeſſor of Logic.
John Walker, D. D. Regius Profeſſor of Natural Hiſtory, and Keeper of the Muſeum.
William Greenfield, A. M. Profeſſor of Rhetoric and Belles Lettres.
John Playfair, A. M. Profeſſor of Mathematics.
Robert Blair, M. D. Regius Profeſſor of Practical Aſtronomy.
James Finlayſon, A. M. Joint Profeſſor of Logic.
Andrew Coventry, M. D. Profeſſor of Agriculture.
Andrew Fiſe, Principal Janitor and Macer.
William Stewart, under Janitor.

N. B. There are only about 50 burſers in this univerſity, and theſe do not exceed 12l. *per annum.*

The number of ſtudents during the laſt ſeſſion of the college, from October 10. 1789 to May 6. 1790, was nearly as follows:

Students of Divinity	130
———— Law	100
———— Phyſic	440
General Claſſes	420
In all	1090

The old buildings being very mean, and unfit for the reception of ſo many profeſſors and ſtudents, and quite unſuitable to the dignity of ſuch a flouriſhing univerſity, as well as inconſiſtent with the improved ſtate of the city, the Lord Provoſt, Magiſtrates, and Council, ſet on foot a ſubſcription for erecting a new ſtructure, according to a deſign of Robert Adam, Eſq; architect. Part of the old fabric has in conſequence been pulled down, and the new building is already in conſiderable forwardneſs. The foundation ſtone was laid on Monday the 16th of November, with great ſolemnity, by the Right Hon. Francis Lord Napier, grand maſter maſon of Scotland, in the preſence of the Right Hon. the Lord Provoſt, Magiſtrates, and Town-Council of the city of Edinburgh, with the Principal, Profeſſors, and Students of the univerſity of Edinburgh, a number of Nobility and Gentry, and the Maſters, Officers, and Brethren, of all the lodges of free maſons in the city and neighbourhood, who marched in proceſſion from the Parliament-Houſe down the High-Street. After the different maſonic ceremonials were performed, two cryſtal-bottles, caſt on purpoſe at the glaſs-houſe of Leith, were depoſited in the foundation-ſtone. In one of theſe were put different coins of the preſent reign, each of them being previouſly enveloped in cryſtal, in ſuch an ingenious manner, that the legend on the coins could be diſtinctly read without breaking the cryſtal. In the other bottle were depoſited ſeven rolls of vellum, containing a ſhort account of the original foundation and preſent ſtate of the univerſity, together with ſeveral other papers, in particular the different newſpapers, containing advertiſements relative to the college, &c. and a liſt of the names of the Principal and Profeſſors, alſo of the preſent Lord Provoſt and Magiſtrates, and Officers of the grand lodge of Scotland. The bottles being carefully ſealed up, were covered with a plate of copper wrapt in block tin; and upon the under ſide of the copper were engraved the arms of the city of Edinburgh and the univerſity; likewiſe the arms of the Right Hon. Lord Napier, grand maſter maſon of Scotland. Upon the upper ſide, a Latin inſcription, of which the following is a copy:

ANNUENTE DEO OPT. MAX.
REGNANTE GEORGIO III. PRINCIPE
MUNIFICENTISSIMO;
ACADEMIÆ EDINBURGENSIS
ÆDIBUS,
INITIO QUIDEM HUMILLIMIS,
ET JAM, POST DUO SECULA, PENE RUINOSIS;
NOVI HUJUS ÆDIFICII,
UBI COMMODITATI SIMUL ET ELEGANTIÆ,
TANTO DOCTRINARUM DOMICILIO
DIGNÆ,
CONSULERETUR,
PRIMUM LAPIDEM POSUIT,
PLAUDENTE INGENTI OMNIUM ORDINUM
FREQUENTIA,
VIR NOBILISSIMUS
FRANCISCUS DOMINUS NAPIER,
REIPUB. ARCHITECTONICÆ APUD SCOTOS
CURIO MAXIMUS:
XVI. KAL. DECEMB.
ANNO SALUTIS HUMANÆ MDCCLXXXIX.
ÆRÆ ARCHITECTONICÆ IↃↃIↃCCLXXXIX.
CONSULE THOMA ELDER,
ACADEMIÆ PRÆFECTO GULIELMO
ROBERTSON,
ARCHITECTO ROBERTO ADAM.
Q. F. F. Q. S.

The eaſt and weſt fronts of this pile are to extend 255 feet, and the ſouth and north 358. There are to be houſes for the principal and ſix or ſeven of the profeſſors. The library is to be a room of 160 feet in length; the muſeum for natural curioſities is to be of the ſame extent; and the dimenſions of the hall for degrees and public exerciſes are about 90 feet by 30. There are likewiſe to be an elegant and moſt convenient anatomical theatre; a chemical laboratory; and large rooms for inſtruments and experiments for the profeſſors of mathematics, natural philoſophy, and agriculture. The whole when finiſhed, if not the moſt ſplendid ſtructure of the ſort in Europe, will however be the completeſt and moſt commodious; and it will do the utmoſt honour to the genius of the architect and to the munificence of the public. About L. 16,000 is already ſubſcribed; and there is no doubt that the aid of parliament will be granted to complete the work.

The botanical garden belonging to the univerſity is ſituated at the diſtance of about a mile, on the road between Edinburgh and Leith. It conſiſts of about five acres of ground; and is furniſhed with a great variety of plants, many of them brought from the moſt diſtant quarters of the globe. The profeſſor is botaniſt to the king, and receives a ſalary of 120l. annually for the ſupport of the garden. A monument, to the memory of the celebrated botaniſt Linnæus, was erected here by the late Dr Hope, who firſt planned the garden, and brought it to perfection.

The univerſity of Edinburgh, like the others in this kingdom, ſends one member to the General Aſſembly of the church of Scotland; and the widows of the profeſſors have a right to the funds of thoſe of miniſters, the profeſſors being truſtees on that fund along with the preſbytery of Edinburgh.

11. *The Royal Infirmary* was firſt thought of by the college of phyſicians in 1725. A fiſhing company happening to be diſſolved at that time, the partners contributed ſome of their ſtock towards the eſtabliſhment of the infirmary. A ſubſcription was alſo ſet on foot, and application made to the General Aſſembly to recommend the ſame throughout their juriſdiction. This was readily complied with, and the aſſembly paſſed an act for that purpoſe; but very little regard was paid to it by the clergy. Notwithſtanding this, however, 2000l. being procured, a ſmall houſe was opened for the reception of the ſick poor in Auguſt 1729. In 1736, the contributors towards the infirmary were erected into a body corporate by royal ſtatute; and after this the contributions increaſed very conſiderably: by which means the managers were enabled to enlarge their ſcheme from time to time; and at laſt to undertake the preſent magnificent ſtructure, the foundation of which was laid in 1738. During 25 years, when this inſtitution was in its infancy, Lord Hopetoun beſtowed upon it an annuity of 400l. In 1750, Doctor Archibald Ker bequeathed to this incorporation 200l. a-year in the iſland of Jamaica. In 1755, the lords of the treaſury made a donation to it of 8000l. which had been appointed for the ſupport of invalids. In return for this, the managers of the infirmary conſtantly keep 60 beds in readineſs for the reception of ſick ſoldiers. This year alſo ſick ſervants began to be admitted into the infirmary, and a ward was fitted up for their reception.

This inſtitution, however, was more indebted to George Drummond, Eſq; than to any other perſon. He was ſeven times choſen lord provoſt of Edinburgh; and always directed his attention to the improvement of the city, particularly to that of the royal infirmary. So ſenſible were the managers of their obligations to him, that, in their hall, they erected a buſt of him with this inſcription, "George Drummond, to whom this country is indebted for all the benefit which it derives from the Royal Infirmary."—In 1748, the ſtock of the infirmary amounted to 5000l; in 1755, to 7076l. beſides the eſtate left by Doctor Ker; in 1764, to 23,426l.; and in 1778, to 27,074l.

The royal infirmary is attended by two phyſicians choſen by the managers, who viſit their patients daily in preſence of the ſtudents. All the members of the college of ſurgeons are alſo obliged to attend in rotation, according to ſeniority. If any ſurgeon declines attendance, he is not allowed to appoint a depute; but the patients are committed to the care of one of four aſſiſtant ſurgeons, choſen annually by the managers.—From the year 1762 to 1769, there were admitted 6261 patients; which number added to 109 who were in the hoſpital at the commencement of the year 1762, made, in all, 6370. Of theſe, 4395 were cured; 358 died; the reſt were either relieved, diſmiſſed incurable, for irregularities, or by their own deſire, or remained in the hoſpital.—From 1770 to 1775, the patients annually admitted into the infirmary were, at an average, 1567; of whom 63 died. In 1776, there were admitted 1668, of whom 57 died; and in 1777, the number admitted was 1593, and of deaths 52. In the year 1786, there were admitted 1822 patients: Of theſe 1354 were cured; 166 relieved; 84 died; the reſt were either relieved, diſmiſſed incurable, for irregularities, or by their own deſire.

The building conſiſts of a body and two wings, each of them three ſtories high, with an attic ſtory and garrets, and a very elegant front. The body is 210 feet long, and 36 broad in the middle, but at the ends only 24 feet broad. There is a buſt of king George II. in a Roman dreſs, above the great door. The wings are 70 feet long, and 24 broad. In the centre is a large ſtair-caſe, ſo wide that ſedan chairs may be carried up. In the different wards, 228 patients may be accommodated, each in a different bed. There are cold and hot baths for the patients, and alſo for the citizens; and to theſe laſt the patients are never admitted.

Beſides the apartments neceſſary for the ſick, there are others for the officers and ſervants belonging to the houſe. There are likewiſe rooms for the managers, a conſulting room for the phyſicians and ſurgeons, a waiting-room for the ſtudents, and a theatre that will hold upwards of 200 people for performing chirurgical operations. There is a military ward, ſupported by the intereſt of the 8000l. already mentioned; and in conſequence of which a ſmall guard is always kept at the infirmary. The wards for ſick ſervants are ſupported by collections at the church doors. Beſides the attendance of the royal college of ſurgeons by rotation, as has already been mentioned, there are two phyſicians belonging to the houſe, who are elected by the managers, and have a ſmall ſalary; there is likewiſe a houſe-ſurgeon and apothecary. Students who attend the infirmary pay 3l. 3s. annually, which brings in a revenue of about 500l. towards defraying the expence of the houſe. Two wards are ſet apart for the patients whoſe caſes are ſuppoſed to be moſt intereſting; and the phyſicians give lectures upon them.

12. *The Public Diſpenſary* was founded by Dr Duncan in 1776, for the poor whoſe diſeaſes are of ſuch a nature as to render their admiſſion into the infirmary either unneceſſary or improper. Here the patients receive advice gratis four days in the week; a regiſter is kept of the diſeaſes of each, and of the effects produced by the medicines employed. All patients not improper for diſpenſary treatment are admitted on the recommendation of the elder or church-warden of the pariſh where they reſide. The phyſicians officiate and give lectures gratis; ſo that the apothecary who lodges in the houſe, and the medicines, are the only expences attending this uſeful inſtitution. The expence of the whole is defrayed by public contributions, and from a ſmall annual fee paid by the ſtudents who attend the lectures. It is under the direction of a preſident, two vice-preſidents, and 20 directors, elected annually from among the contributors. One guinea intitles a contributor to recommend patients and be a governor for two years, and five guineas gives the ſame privilege for life.

13. *The High School.* The earlieſt inſtitution of a grammar-ſchool in Edinburgh ſeems to have been about the year 1519. The whole expence beſtowed upon the firſt building of this kind amounted only to about 40l. Sterling. Another building, which had been erected for the accommodation of the ſcholars in 1578, continued, notwithſtanding the great increaſe of their number, to be uſed for that purpoſe till 1777. The foundation of the preſent new building was laid on the 24th of June that year by Sir William Forbes, Grand Maſter of the Free Maſons. The total length of this building is 120 feet from ſouth to north; the breadth in the middle 36, at each end 38 feet. The great hall where the boys meet for prayers, is 68 feet by 30. At each end of the hall is a room of 32 feet by 20, intended for libraries. The building is two ſtories high, the one 18, the other 17, feet in height. The expence of the whole when finiſhed is reckoned at 4000l.

There is a rector and four maſters, who teach from 4 to 500 ſcholars annually. The ſalaries are trifling, and the fees depend upon the reputation they have obtained for teaching; and as this has been for ſome years very conſiderable, the rector's place is ſuppoſed to be worth not leſs than 400l. *per annum*, a maſter's about half that ſum. There is a janitor, whoſe place is ſuppoſed to be worth about 70l. a-year. His buſineſs is to take care of the boys on the play-ground; and there is a woman who lives on the ſpot as under janitor, whoſe place may be worth about 25l. annually. There is a library, but not large, as each of the boys pays only one ſhilling annually to its ſupport.

There are four eſtabliſhed Engliſh ſchools in Edinburgh; the maſters of which receive a ſmall ſalary, upon expreſs condition that they ſhall not take above five ſhillings per quarter from any of their ſcholars. There are likewiſe many other private ſchools in Edinburgh for all languages; and, in general, every kind of education is to be had here in great perfection and at a very cheap rate.

14. *The Mint* is kept up by the articles of union, with all the offices belonging to it, though no money is ever ſtruck here. It ſtands in the Cowgate, a little to the weſt of the Engliſh church; but is in a ruinous ſtate, though ſtill inhabited by the different officers, who have free houſes; and the bell-man enjoys his ſalary by regularly ringing the bell. This place, as well as the abbey of Holyrood-houſe, is an aſylum for debtors.

15. *The Engliſh Chapel* ſtands near the Cowgate port, and was founded on the 3d of April 1771. The foundation-ſtone was laid by general Oughton, with the following inſcription: *Edifici ſacr. Eccleſiæ epiſc. Angliæ, primum poſuit lapidem J. Adolphus Oughton, in architectonicæ Scotiæ repub. curio maximus, militum præfectus, regnante Georgio III. tertio Apr. die, A. D.* MDCCLXXI. It is a plain handſome building, neatly fitted up in the inſide, and ſomewhat reſembling the church of St Martin's in the Fields, London. It is 90 feet long, 75 broad, and ornamented with an elegant ſpire of conſiderable height. It is alſo furniſhed with an excellent bell, formerly belonging to the chapel royal at Holyrood-houſe, which is permitted to be rung for aſſembling the congregation; an indulgence not granted to the Preſbyterians in England. The expence of the building was defrayed by voluntary ſubſcription;

and, to the honour of the country, people of all perſuaſions contributed to this pious work. It has already coſt 7000 l. and will require 1000 l. more to finiſh the portico. This church is built in a ſingular manner, viz. from ſouth to north, and the altar-piece ſtands on the eaſt ſide. Three clergymen officiate here, of whom the firſt has 150 l. the other two 100 l. each. The altar-piece is finely decorated, and there is a good organ.

There is another Epiſcopal chapel, but ſmall, in Black-fryars wynd, which was founded by Baron Smith in the year 1722. There are alſo ſome meetings of the Epiſcopal church of Scotland, who adhere to their old forms, having ſtill their biſhops and inferior clergy. For ſome time theſe were ſubjected to penal laws, as they refuſed to take the oath to government, or mention the preſent royal family in their public prayers: but of late they have conformed, and had their conduct approved of by his Majeſty; ſo that now every denomination of Chriſtians in Britain pray for the royal family on the throne.

16. *Heriot's Hoſpital* owes its foundation to George Heriot, goldſmith to James VI. who acquired by his buſineſs a large fortune. At his death, he left the magiſtrates of Edinburgh 23,625 l. 10 s. "for the maintenance, relief, and bringing up of ſo many poor and fatherleſs boys, freemens ſons of the town of Edinburgh," as the above ſum ſhould be ſufficient for. This hoſpital is finely ſituated on the weſt end of the ſouth ridge, almoſt oppoſite to the caſtle, and is the moſt magnificent building of the kind in Edinburgh. It was founded in July 1628, according to a plan (as is reported) of Inigo Jones; but the work being interrupted by the civil wars, it was not finiſhed till the year 1650. The expence of the building is ſaid to have been upwards of 30,000 l (A): and the hoſpital is now poſſeſſed of an income of about 3000 l. a-year; though this cannot be abſolutely aſcertained, as the rents are paid in grain, and of courſe muſt be fluctuating.

It ſtands on a riſing ground to the ſouth-weſt of the city, and is a ſquare of 162 feet without, having a court 94 feet ſquare in the inſide, with piazzas on three of the ſides. There is a ſpire with a clock over the gateway, and each corner of the building is ornamented with turrets; but notwithſtanding the magnificent appearance of the outſide, the inner part is far from being convenient. There is a ſtatue of the founder over the gateway, in the dreſs of the times, and a very good painting of him in the governor's room, with a picture of the late treaſurer Mr Carmichael. There is a chapel 61 feet long and 22 broad, which is now repairing in ſuch a manner as will make it worthy of notice. When Cromwell took poſſeſſion of Edinburgh after the battle of Dunbar, he quartered his ſick and wounded ſoldiers in this hoſpital. It was applied to the ſame purpoſe till the year 1658, when general Monk, at the requeſt of the governors, removed the ſoldiers; and on the 11th of April 1659, it was opened for the reception of boys, 30 of whom were admitted into it. The Auguſt after, they were increaſed to 40; and in 1661, to 52. In 1753 the number was raiſed to 130, and in 1763 to 140; but ſince that time it has decreaſed.—In this hoſpital the boys are inſtructed in reading, writing, arithmetic, and a knowledge of the Latin tongue. With ſuch as chooſe to follow any kind of trade, an apprentice-fee of 30 l. is given when they leave the hoſpital; and thoſe who chooſe an academical education, have an annuity of 10 l. a-year beſtowed on them for four years. The whole is under the overſight of the treaſurer, who has under him a houſe-governor, houſe-keeper, and ſchool-maſters.

17. *Watſon's Hoſpital* has its name from the founder George Watſon, who was at firſt clerk to Sir William Dick provoſt of Edinburgh in 1676, then accountant of the bank of Scotland; after that he became receiver of the city's impoſt on ale, treaſurer to the Merchant's Maiden Hoſpital, and to the ſociety for propagating Chriſtian knowledge. Dying a bachelor in 1723, he left 12,000 l. for the maintenance and education of the children and grand-children of decayed members of the merchant company of Edinburgh. The ſcheme, however, was not put in execution till the year 1738, when the ſum originally left had accumulated to 20,000 l. The preſent building was then erected, in which about 60 boys are maintained and educated. It is much leſs magnificent than Heriot's hoſpital, but the building is far from being deſpicable. It ſtands to the ſouthward of the city at a ſmall diſtance from Heriot's hoſpital, and was erected at the expence of 5000 l.: its preſent revenue is about 1700 l. It is under the management of the maſter, aſſiſtants, and treaſurer of the Merchant Company, four old bailies, the old dean of guild, and the two miniſters of the old church. The boys are genteelly clothed and liberally educated. Such as chooſe an univerſity education are allowed 10 l. *per annum* for five years: thoſe who go to trades have 20 l. allowed them for their apprentice fee; and at the age of 25 years, if they have behaved properly, and not contracted marriage without conſent of the governors, they receive a bounty of 50 l. The boys are under the immediate inſpection of the treaſurer, ſchool-maſter, and houſe-keeper.

18. *The Merchants Maiden Hoſpital* was eſtabliſhed by voluntary contribution about the end of the laſt century, for the maintenance of young girls, daughters of the merchants burgeſſes of Edinburgh. The governors were erected into a body corporate, by act of parliament, in 1707. The annual revenue amounts to 1350 l. Seventy girls are maintained in it; who, upon leaving the houſe, receive 3 l. 6 s. 8 d. excepting a

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(A) It is to be obſerved, that money then bore 10 l. *per cent.* intereſt.—The above ſums are taken from Mr Arnot's Hiſtory of Edinburgh, who ſubjoins the following note. "Where Maitland had collected his moſt erroneous account of George Heriot's effects, we do not know. He makes the ſum received, out of Heriot's effects, by the governors of the hoſpital, to be 43,608 l. 11 s. 3 d. being almoſt the double of what they really got. This blunder has been the cauſe of many unjuſt murmurings againſt the magiſtrates of Edinburgh, and even the means of ſpiriting up law-ſuits againſt them."

a few who are allowed 8l. 6s. 8d. out of the funds of the hoſpital. The profits ariſing from work done in the houſe are alſo divided among the girls, according to their induſtry.

19. *The Trades Maiden Hoſpital* was founded in the year 1704 by the incorporations of Edinburgh, for the maintenance of the daughters of decayed members, on a plan ſimilar to that of the merchants hoſpital. To this, as well as to the former, one Mrs Mary Erſkine, a widow gentlewoman, contributed ſo liberally, that ſhe was by the governors ſtyled *joint foundreſs* of the hoſpital. Fifty girls are maintained in the houſe, who pay of entry-money 1l. 13s. 4d.; and, when they leave it, receive a bounty of 5l. 11s. 1½d. The revenues are eſtimated at 600l. a-year.

20. *The Orphan Hoſpital* was planned in 1732 by Andrew Gairdner merchant, and other inhabitants. It was promoted by the ſociety for propagating Chriſtian knowledge, by other ſocieties, by voluntary ſubſcriptions, and a collection at the church-doors.—In 1733, the managers hired a houſe, took in 30 orphans, maintained them, gave them inſtructions in reading and writing, and taught them the weaving buſineſs. In 1735, they were erected into a body corporate by the town of Edinburgh: and, in 1742, they obtained a charter of erection from his late majeſty, appointing moſt of the great officers of ſtate in Scotland, and the heads of the different ſocieties in Edinburgh, members of this corporation; with powers to them to hold real property to the amount of 1000l. a-year. The revenue is inconſiderable; but the inſtitution is ſupported by the contributions of charitable perſons. Into this hoſpital orphans are received from any part of the kingdom. None are admitted under ſeven, nor continued in it after 14 years of age. At preſent (1790) about 140 orphans are maintained in it.

The orphan hoſpital is ſituated to the eaſt of the north bridge; and is a handſome building, conſiſting of a body and two wings, with a neat ſpire, furniſhed with a clock and two bells. The late worthy Mr Howard admits, that this inſtitution is one of the moſt uſeful charities in Europe, and is a pattern for all inſtitutions of the kind. The funds have been conſiderably increaſed, and the building greatly improved, through the attention and exertions of Mr Thomas Tod the preſent treaſurer.

21. *The Trinity Hoſpital.* This was originally founded and amply endowed by king James II.'s queen. At the Reformation, it was ſtripped of its revenues; but the regent afterwards beſtowed them on the provoſt of Edinburgh, who gave them to the citizens for the uſe of the poor. In 1585, the town-council purchaſed from Robert Pont, at that time provoſt of Trinity college, his intereſt in theſe ſubjects; and the tranſaction was afterwards ratified by James VI. The hoſpital was then repaired, and appointed for the reception of poor old burgeſſes, their wives, and unmarried children, not under 50 years of age. In the year 1700, this hoſpital maintained 54 perſons; but, ſince that time, the number has decreaſed.—The revenue conſiſts in a real eſtate of lands and houſes, the groſs rent of which are 762l. a-year; and 5500l. lent out in bonds at 4 per cent.

This hoſpital is ſituated at the foot of Leith-wynd, and maintains about 50 of both ſexes, who are comfortably lodged, each having a room for themſelves. They are ſupplied with roaſt or boiled meat every day for dinner, have money allowed them for clothes, and likewiſe a ſmall ſum for pocket-money. There is a ſmall library for their amuſement, and they have a chaplain to ſay prayers. There are ſome out-penſioners who have 6l. a-year, but theſe are diſcouraged by the governors. The funds are under the management of the town-council.

22. *The Charity Workhouſe* was erected in 1743 by voluntary contribution. It is a large plain building, on the ſouth ſide of the city. Here the poor are employed, and are allowed twopence out of every ſhilling they earn. The expence of this inſtitution is ſuppoſed not to be leſs than 4000l. annually; as about 700 perſons of both ſexes, including children, are maintained here, each of whom cannot be reckoned to coſt leſs than 4l. 10s. *per annum;* and there are beſides 300 out-penſioners. The only permanent fund for defraying this expence is a tax of two *per cent.* on the valued rents of the city, which may bring in about 600l. annually; and there are other funds which yield about 400l. The reſt is derived from collections at the church doors and voluntary contributions; but as theſe always fall ſhort of what is requiſite, recourſe muſt frequently be had to extraordinary collections. The ſum ariſing from the rents of the city, however, is conſtantly increaſing; but the members of the College of Juſtice are exempted from the tax.

There are two other charity workhouſes in the ſuburbs, much on the ſame plan with that now deſcribed; one in the Canongate, and the other in St Cuthbert's or Weſt Kirk pariſh.

To this account of the charitable eſtabliſhments in Edinburgh, we ſhall add that of ſome others; which, though not calculated to decorate the city by any public building, are perhaps no leſs deſerving of praiſe than any we have mentioned. The firſt is that of Captain William Horn; who left 3500l. in truſt to the magiſtrates, the annual profits to be divided on Chriſtmas day to poor out-day labourers, who muſt at that ſeaſon of the year be deſtitute of employment; five pounds to be given to thoſe who have large families, and one half to thoſe who have ſmaller.

Another charity is that of Robert Johnſton, L.L.D. of London, who in 1640 left 3000l. to the poor of this city; 1000l. to be employed in ſetting them to work, another 1000l. to clothe the boys in Heriot's Hoſpital, and the third 1000l. to burſers at the univerſity.

About the beginning of this century John Strachen left his eſtate of Craigcrook, now upwards of 300l. a-year, in truſt to the preſbytery of Edinburgh, to be by them diſpoſed of in ſmall annual ſums to poor old people not under 65 years of age, and to orphans not above 12.

There is beſides a ſociety for the ſupport of the induſtrious poor, another for the indigent ſick, and there are alſo many charity-ſchools.

Having thus given an account of the moſt remarkable edifices belonging to Old Edinburgh, we ſhall now proceed to thoſe of the New Town. This is terminated on the eaſt ſide by the Calton-hill, round which there is a pleaſant walk, and which affords one of the fineſt proſpects that can be imagined, varying remarkably almoſt at every ſtep. On this hill is a burying-ground, which contains a fine monument to the memory of David Hume the hiſtorian.—On the top is an Obſervatory, the ſcheme for building which was firſt adopted in the year 1736; but the diſturbance occaſioned by the Porteous mob prevented any thing from being done towards the execution of it at that time. The Earl of Morton afterwards gave 100 l. for the purpoſe of building an obſervatory, and appointed Mr M‘Laurin profeſſor of mathematics, together with the principal and ſome profeſſors of the univerſity, truſtees for managing the ſum. Mr M‘Laurin added to the money above mentioned the profits ariſing from a courſe of lectures which he read on experimental philoſophy; which, with ſome other ſmall ſums, amounted in all to 300 l.: but Mr M‘Laurin dying, the deſign was dropped.—Afterwards the money was put into the hands of two perſons who became bankrupt; but a conſiderable dividend being obtained out of their effects, the principal and intereſt, about the year 1776, amounted to 400 l. A plan of the building was made out by Mr Craig architect; and the foundation-ſtone was laid by Mr Stodart, lord provoſt of Edinburgh, on the 25th of Auguſt 1776. About this time, however, Mr Adam architect happening to come to Edinburgh, conceived the idea of giving the whole the appearance of a fortification, for which its ſituation on the top of the Calton-hill was very much adapted. Accordingly a line was marked out for incloſing the limits of the obſervatory with a wall conſtructed with buttreſſes and embraſures, and having Gothic towers at the angles. Thus the money deſigned for the work was totally exhauſted, and the obſervatory ſtill remains unfiniſhed; nor is there any appearance of its being ſoon completed either by voluntary ſubſcription or any other way.

23. Proceeding to the weſtward, the firſt remarkable building is the *Theatre*, which ſtands oppoſite to the Regiſter Office, in the middle of Shakeſpeare Square. The building is plain on the outſide, but elegantly fitted up within, and is generally open three days in the week, and when full will draw about 150 l. a-night; ſo that the manager generally finds himſelf well rewarded when he can procure good actors.

Entertainments of the dramatic kind came very early into faſhion in this country. They were at firſt only repreſentations of religious ſubjects, and peculiarly deſigned to advance the intereſts of religion; the clergy being the compoſers, and Sunday the principal time of exhibition. In the 16th century, the number of playhouſes was ſo great, that it was complained of as a nuiſance, not only in Edinburgh, but throughout the kingdom. They ſoon degenerated from their original inſtitution; and the plays, inſtead of being calculated to inſpire devotion, became filled with all manner of buffoonery and indecency.—After the Reformation, the Preſbyterian clergy complained of theſe indecencies; and being actuated by a ſpirit of violent zeal, anathematiſed every kind of theatrical repreſentation whatever. King James VI. compelled them to paſs from their cenſures againſt the ſtage; but in the time of Charles I. when fanaticiſm was carried to the utmoſt length at which perhaps it was poſſible for it to arrive, it cannot be ſuppoſed that ſtage plays would be tolerated.—It ſeems, however, that amuſements of this kind were again introduced at Edinburgh about the year 1684, when the Duke of York kept his court there. His reſidence at Edinburgh drew off one half of the London company, and plays were acted in Edinburgh for ſome little time. The misfortunes attending the Duke of York, however, and the eſtabliſhment of the Preſbyterian religion (the genius of which is unfavourable to amuſements of this kind), ſoon put a ſtop to the progreſs of the ſtage, and no theatrical exhibition was heard of in Edinburgh till after the year 1715. The firſt adventurer was Signora Violante, an Italian, remarkable for feats of ſtrength, tumbling, &c. In this way ſhe firſt exhibited in a houſe at the foot of Carrubber's Cloſe, which has ſince been employed by different ſectaries for religious purpoſes. Meeting with good ſucceſs, ſhe ſoon invited a company of comedians from London; and theſe being alſo well received, Edinburgh continued for ſome years to be entertained with the performances of a ſtrolling company, who viſited it annually. Becoming at laſt, however, obnoxious to the clergy, they were in 1727 prohibited by the magiſtrates from acting within their juriſdiction. But this interdict was ſuſpended by the Court of Seſſion, and the players continued to perform as uſual.

Still, however, theatrical entertainments were but rare. The town was viſited by itinerant companies only once in two or three years. They performed in the Taylor's Hall in the Cowgate; which, when the houſe was full, would have drawn (at the rate of 2 s. 6d. for pit and boxes, and 1 s. 6d. for the gallery) 40l. or 45 l. a-night. About this time an act of parliament was paſſed, prohibiting the exhibition of plays, except in a houſe licenſed by the king. Of this the preſbytery of Edinburgh immediately laid hold; and at their own expence brought an action on the ſtatute againſt the players. The cauſe was by the Court of Seſſion decided againſt the players; who thereupon applied to parliament for a bill to enable his majeſty to licenſe a theatre in Edinburgh. Againſt this bill petitions were preſented in 1739 to the houſe of commons by the magiſtrates and town-council, the principal and profeſſors of the univerſity, and the dean of guild and his council; in conſequence of which, the affair was dropped. All this oppoſition, however, contributed in reality to the ſucceſs of the players; for the ſpirit of party being excited, a way of evading the act was eaſily found out, and the houſe was frequented more than uſual, inſomuch that Taylor's Hall was found inſufficient to contain the number of ſpectators.

The comedians now fell out among themſelves, and a new playhouſe was erected in the Canongate in the year 1746. The conſequence of this was, that the old one in Taylor's Hall became entirely deſerted, and through bad conduct the managers of the new theatre ſoon found themſelves greatly involved. At laſt, a riot enſuing through diſſenſions among the performers, the playhouſe was totally demoliſhed.—When the extenſion of the royalty over the ſpot where the New Town is built was obtained, a clauſe was likewiſe added to the bill, enabling his majeſty to licenſe a theatre in Edinburgh. This was obtained, and thus the oppoſition of the clergy for ever ſilenced. But notwithſtanding this, the high price paid by the managers to the patentee, being no leſs than 500 guineas annually, prevented them effectually from decorating the houſe as they would otherwiſe have done, or even from always retaining good actors in their ſervice; by which means the ſucceſs of the Edinburgh theatre has not been ſo great as might have been expected.

Not far from this building, an amphitheatre was opened in 1790, on the road to Leith, for equeſtrian exhibitions, pantomime entertainments, dancing, and tumbling. The circus is 60 feet diameter; and in the forenoon ladies and gentlemen are taught to ride. The houſe will hold about 1500 people.

24. *The Regiſter Office.* This work was firſt ſuggeſted by the late Earl of Morton, lord-regiſter of Scotland, with a view to prevent the danger which attended the uſual method of keeping the public records. In former times, indeed, theſe ſuffered from a variety of accidents. Edward I. carried off or deſtroyed moſt of them, in order to prevent any marks of the former independency of the nation from remaining to poſterity. Afterwards Cromwell ſpoiled this nation of its records, moſt of which were ſent to the tower of London. At the time of the Reſtoration, many of them were ſent down again by ſea; but one of the veſſels was ſhipwrecked, and the records brought by the other have ever ſince been left in the greateſt confuſion.—The Earl of Morton taking this into conſideration, obtained from his majeſty a grant of 12,000l. out of the forfeited eſtates, for the purpoſe of building a regiſter-office, or houſe for keeping the records, and diſpoſing them in proper order. The foundation was laid on the 27th of June 1774, by Lord Frederic Campbell lord-regiſter, Mr Montgomery of Stanhope lord advocate, and Mr Miller of Barſkimming lord juſtice-clerk; three of the truſtees appointed by his majeſty for executing the work. The ceremony was performed under a diſcharge of artillery, in preſence of the judges of the courts of ſeſſion and exchequer, and in the ſight of a multitude of ſpectators. A braſs plate was put into the foundation-ſtone with the following inſcription: CONSERVANDIS TABULIS PUBLICIS POSITUM EST, ANNO M.DCC.LXXIV, MUNIFICENTIA OPTIMI ET PIETISSIMI PRINCIPIS GEORGII TERTII. In a glaſs vaſe hermetically ſealed, which is alſo placed in the foundation-ſtone, are depoſited ſpecimens of the different coins of his preſent majeſty.

The front of the building directly faces the bridge, extends from eaſt to weſt 200 feet, and is 40 feet back from the line of Prince's-ſtreet. In the middle of the front is a ſmall projection of three windows in breadth. Here is a pediment, having in its centre the arms of Great Britain, and the whole is ſupported by four Corinthian pilaſtres. At each end is a tower projecting beyond the reſt of the building, having a Venetian window in front, and a cupola on the top. The front is ornamented from end to end with a beautiful Corinthian entablature. In the centre of the building is a dome of wooden work covered with lead. The inſide forms a ſaloon 50 feet diameter and 80 high, lighted at top by a copper window 15 feet in diameter. Round the whole is a hanging gallery of ſtone, with an iron balluſtrade, which affords conveniency for preſſes in the walls for keeping the records. The whole number of apartments is 97; all of which are vaulted beneath, and warmed with fire-places. This building, which is the moſt beautiful of Mr Adams's deſigns, has been executed in a ſubſtantial manner, in about 16 years, at the expence of near 40,000 l. and is one of the principal ornaments of the city. A ſerjeant's guard is placed here from the caſtle, for the further protection of the records. It is intended to place a ſtatue of his preſent Majeſty in the front of the building, with the lion and unicorn above the centinels boxes. The lord-regiſter has the direction of the whole, and the principal clerks of Seſſion are his deputes. Theſe have a great number of clerks under them for carrying on the buſineſs of the Court of Seſſion. The lord-regiſter is a miniſter of ſtate in this country. He formerly collected the votes of the parliament of Scotland, and ſtill collects thoſe of the peers at the election of 16 to repreſent them in parliament.

25. On the eaſt ſide of St Andrew's Square ſtands the *General Exciſe Office*, built by the late Sir Laurence Dundas for his own reſidence, but ſold by his ſon for the above purpoſe. It is a very handſome building, with a pediment in front ornamented with the king's arms, and ſupported by four Corinthian pilaſtres; and, in conjunction with the two corner houſes, has a fine effect.

26. *St Andrew's Church* ſtands on the north ſide of George's Street. It is of an oval form; and has a very neat ſpire of 186 feet in height, with a chime of eight bells, the firſt and only one of the kind in Scotland. It has alſo a handſome portico in front.

27. Oppoſite to St Andrew's church is the *Phyſicians Hall*, deſigned for the meetings of the faculty, and which has a portico reſembling that of the church.

28. Farther to the weſtward, on the ſouth ſide, ſtand the *Aſſembly-rooms*, which though a heavy looking building on the outſide, are nevertheleſs extremely elegant and commodious within. The largeſt is 100 feet long and 40 broad, being exceeded in its dimenſions by none in the iſland, the large one at Bath excepted. Weekly aſſemblies are held here for dancing and card-playing, under the direction of a maſter of ceremonies; admiſſion-tickets five ſhillings each.

29 Religious eſtabliſhments.

It now remains only to ſpeak ſomething of the religious and civil eſtabliſhments of this metropolis. The higheſt of the former is the General Aſſembly of the Church of Scotland, who meet here annually in the month of May, in an aiſle of the church of St Giles fitted up on purpoſe for them. The throne is filled by a commiſſioner from his majeſty, but he neither debates nor votes. He calls them together, and diſſolves them at the appointed time in the name of the king; but they call and diſſolve themſelves in the name of the Lord Jeſus Chriſt. This aſſembly conſiſts of 350 members choſen out of the various preſbyteries throughout the kingdom; and the debates are often very intereſting and eloquent. This is the ſupreme eccleſiaſtical court in Scotland, to which appeals lie from the inferior ones.

The eccleſiaſtical court next in dignity to the aſſembly is the Synod of Lothian and Tweeddale, who meet in the ſame place in April and November; and next to them is the Preſbytery of Edinburgh. Theſe meet on the laſt Wedneſday of every month, and are truſtees on the fund for miniſters widows. They have a hall in Scott's cloſe, where there is a good picture of Dr Webſter by Martin, which was put up at the expence of the truſtees, out of gratitude for the trouble he took in planning and fully eſtabliſhing the fund.

The Society for Propagating Chriſtian Knowledge in the Highlands and Iſlands of Scotland, was eſtabliſhed a body corporate by queen Anne in the year 1709, for the purpoſe of erecting ſchools to inſtruct poor children in the principles of Chriſtianity, as well as in reading and writing. The ſociety have a hall in Warriſton's cloſe where their buſineſs is tranſacted. From time to time they have received large contributions, which have always been very properly applied; and for much the ſame purpoſe his majeſty gives 1000 l. annually to the general aſſembly of the church of Scotland, which is employed by a committee of their number for inſtructing the poor Highlanders in the principles of the Chriſtian religion.

The Earſe church at Edinburgh was built about 20 years ago by ſubſcription for the ſame laudable purpoſe. Great numbers of people reſort to the metropolis from the Highlands, who underſtand no other language but their own, and conſequently have no opportunity of inſtruction without it; and a moſt remarkable proof of the benefit they have received from it is, that though the church is capable of holding 1000 people, yet it is not large enough for thoſe who apply for ſeats. The miniſter has 100 l. *per annum* ariſing from the ſeat-rents, and holds communion with the church of Scotland. The eſtabliſhment was promoted by William Dickſon dyer in Edinburgh.

30
Political conſtitution.

With regard to the political conſtitution of Edinburgh, the town-council have the direction of all public affairs. The *ordinary* council conſiſts only of 25 perſons; but the *council ordinary and extraordinary*, of 33. The whole is compoſed of merchants and tradeſmen, whoſe reſpective powers and intereſts are ſo interwoven, that a balance is preſerved between the two bodies. The members of the town-council are partly elected by the members of the 14 incorporations, and they partly chooſe their own ſucceſſors. The election is made in the following manner: Firſt a liſt or *leet* of ſix perſons is made out by each incorporation; from which number, the deacon belonging to that incorporation muſt be choſen. Theſe liſts are then laid before the ordinary council of 25, who "ſhorten the *leets*," by expunging one half of the names from each; and from the three remaining ones the deacon is to be choſen. When this election is over, the new deacons are preſented to the ordinary council, who chooſe ſix of them to be members of their body, and the ſix deacons of laſt year then walk off. The council of 25 next proceed to the election of three merchant and two trades counſellors. The members of council, who now amount to 33 in number, then make out *leets*, from which the lord provoſt, dean of guild, treaſurer, and bailies muſt be choſen. The candidates for each of theſe offices are three in number; and the election is made by the 30 members of council already mentioned, joined to the eight *extraordinary* council-deacons.

The lord provoſt of Edinburgh, who is ſtyled *right honourable*, is high ſheriff, coroner, and admiral, within the city and liberties, and the town, harbour, and road of Leith. He has alſo a juriſdiction in matters of life and death. He is preſes of the convention of royal boroughs, colonel of the trained bands, commander of the city-guard and of Edinburgh jail. In the city he has the precedency of all the great officers of ſtate and of the nobility; walking on the right hand of the king or of his majeſty's commiſſioner; and has the privilege of having a ſword and mace carried before him. Under him are four magiſtrates called *bailies*, whoſe office is much the ſame with that of aldermen in London. There is alſo a dean of guild, who has the charge of the public buildings, and without whoſe warrant no houſe nor building can be erected within the city. He has a council to conſult with, a nominal treaſurer, who formerly had the keeping of the town's money, which is now given to the chamberlain. Theſe ſeven are elected annually; who with the ſeven of the former year, three merchants and two trades counſellors, and 14 deacons or preſes of incorporated trades, making in all 33, form the council of the city, and have the ſole management and diſpoſal of the city revenues; by which means they have the diſpoſal of places to the amount of 20,000 l. annually. Formerly the provoſt was alſo an officer in the Scots parliament. The magiſtrates are ſheriffs-depute and juſtices of the peace; and the town council are alſo patrons of all the churches in Edinburgh, patrons of the univerſity, and electors of the city's repreſentative in parliament. They have beſides a very ample juriſdiction both civil and criminal. They are ſuperiors of the Canongate, Portſburgh, and Leith; and appoint over theſe certain of their own number, who are called *baron bailies*: but the perſon who preſides over Leith has the title of *admiral*, becauſe he hath there a juriſdiction over maritime affairs. The baron bailies appoint one or two of the inhabitants of their reſpective diſtricts to be their ſubſtitutes, and theſe are called *reſident bailies*. They hold courts in abſence of the baron-bailies, for petty offences, and diſcuſſing civil cauſes of little moment.

No city in the world affords greater ſecurity to the inhabitants in their perſons and properties than Edinburgh. Robberies are here very rare, and a ſtreet-murder hardly known in the memory of man; ſo that a perſon may walk the ſtreets at any hour of the night in perfect ſecurity. This is in a great meaſure owing to the *town-guard*. This inſtitution originated from the conſternation into which the citizens were thrown after the battle at Flowden. At that time, the town-council commanded the inhabitants to aſſemble in defence of the city, and every fourth man to be on duty each night. This introduced a kind of perſonal duty for the defence of the town, called *watching and warding*; by which the trading part of the inhabitants were obliged in perſon to watch alternately, in order to prevent or ſuppreſs occaſional diſturbances. This, however, becoming in time extremely inconvenient, the town-council, in 1648, appointed a body of 60 men to be raiſed; the captain of which was to have a monthly pay of 11 l. 2 s. 3 d. two lieutenants of 2 l. each, two ſerjeants of 1 l. 5 s. and the private men of 15 s. each. No regular fund was eſtabliſhed for defraying this expence; the conſequence of which was, that the old method of watching and warding was reſumed: but the people on whom this ſervice devolved were now become ſo relaxed in their diſcipline, that the magiſtrates were threatened with having the king's troops

31
Town guard.

troops quartered in the city if they did not appoint a ſufficient guard. On this 40 men were raiſed in 1679, and in 1682 the number was increaſed to 108. After the revolution, the town-council complained of the guard as a grievance, and requeſted parliament that it might be removed. Their requeſt was immediately granted, and the old method of watching and warding was renewed. This, however, was now ſo intolerable, that the very next year they applied to parliament for leave to raiſe 126 men for the defence of the city, and to tax the citizens for their payment. This being granted, the corps was raiſed which ſtill continues under the name of the *town-guard*. At preſent the eſtabliſhment conſiſts of three officers and about 90 men, who mount guard by turns. The officers have a lieutenant's pay; the ſergeants, corporals, drummers, and common ſoldiers, the ſame with thoſe of the army. Their arms are the ſame with thoſe of the king's forces; but when called upon to quell mobs, they uſe Lochaber-axes, a part of the ancient Scottiſh armour now in uſe only among themſelves.

32
Militia or trained bands.

The militia or trained band of the city conſiſt of 16 companies of 100 men each. They were in uſe to turn out every king's birth-day; but only the officers now remain, who are choſen annually. They conſiſt of 16 captains and as many lieutenants; the provoſt, as has already been mentioned, being the colonel.

The town-guard are paid chiefly by a tax on the trading people; theſe being the only perſons formerly ſubject to watching and warding. This tax, however, amounts only to 1250l. and as the expence of the guard amounts to 1400l. the magiſtrates are obliged to defray the additional charge by other means.

33
Number of inhabitants.

The number of inhabitants in the city of Edinburgh is ſomewhat uncertain, and has been very variouſly calculated. By a ſurvey made in the year 1775, it appears that the number of families in the city, Canongate, and other ſuburbs, and the town of Leith, amounted to 13,806. The difficulty therefore is to fix the number of perſons in a family. Dr Price fixes this number at $4\frac{1}{10}$; Mr Maitland, at $5\frac{1}{2}$; and Mr Arnot, at 6: ſo that, according to this laſt gentleman, the whole number of inhabitants is 82,836; to which he thinks 1400 more may be added for thoſe in the garriſon, hoſpitals, &c. There are in Edinburgh 14 incorporations, capable of chooſing their own deacons, viz. The royal college of ſurgeons; the corporations of goldſmiths, ſkinners, furriers, hammermen, wrights and maſons, taylors, bakers, butchers, ſhoemakers, weavers, waukers, bonnet-makers, and merchant-company. The revenue of the city, ariſing partly from duties of different kinds, and partly from landed property, is eſtimated at about 10,000l. per annum.

34
Plenty of proviſions.

The markets of Edinburgh are plentifully ſupplied with all ſorts of proviſions. Freſh butcher-meat, as well as fowl and fiſh, if the weather permit, may be had every day; and no city can be better ſupplied with garden ſtuffs. The Edinburgh ſtrawberries particularly are remarkably large and fine. A remarkable inſtance of the plenty of proviſions with which Edinburgh is ſupplied was obſerved in the year 1779, when ſeveral large fleets, all of them in want of neceſſaries, arrived in the Forth, to the amount of about 500 ſail, and having on board at leaſt 20,000 men; yet the increaſed conſumption of proviſions, which certainly enſued upon the arrival of ſo many ſtrangers, made not the leaſt increaſe in the rate of the markets, inſomuch that ſeveral victualling ſhips ſent down by the navy-board returned without opening their hatches. The city-mills are let to the corporation of bakers in Edinburgh; and the bread made in the city is remarkable for its goodneſs.

Edinburgh is ſupplied with water brought for ſome miles in pipes, and lodged in two reſervoirs, from whence it is diſtributed through the city both to public wells and private families. A revenue accrues to the town from the latter, which muſt undoubtedly increaſe in proportion as the city extends in magnitude.

There are but few merchants in Edinburgh, moſt of them reſiding at the port of Leith; ſo that the ſupport of the city depends on the conſumption of the neceſſaries as well as the ſuperfluities of life. There are five different ſorts of people on whom the ſhopkeepers, publicans, and different trades depend: 1. The people of the law, who are a very reſpectable body in the city. 2. The number of young people of both ſexes who come to town for their education, many of the parents of whom come along with them. 3. The country gentlemen, gentlemen of the army and navy, and people who have made their fortunes abroad, &c. all of whom come to attend the public diverſions, or to ſpend their time in ſuch a manner as is moſt agreeable to them. 4. The vaſt concourſe of travellers from all parts. 5. Moſt of the money drawn for the rents of country gentlemen is circulated among the bankers or other agents.

At Edinburgh there are excellent manufactures of linen and cambrics; there are alſo manufactures of paper in the neighbourhood, and printing is carried on very extenſively. But for ſome time the capital branch about Edinburgh has been building: which has gone on, and ſtill continues to do ſo, with ſuch rapidity, that the city has been increaſed exceedingly in its extent; and it is not uncommon to ſee a houſe built in a few months, and even inhabited before the roof is quite finiſhed.

EDITOR, a perſon of learning, who has the care of an impreſſion of any work, particularly that of an ancient author: thus, Eraſmus was a great editor; the Louvain doctors, Scaliger, Petavius, F. Sirmond, biſhop Walton, Mr Hearne, Mr Ruddiman, &c. are likewiſe famous editors.

EDOM, or Esau, the ſon of Iſaac and brother of Jacob. The name of Edom, which ſignifies *red*, was given him, either becauſe he ſold his birth-right to Jacob for a meſs of red pottage, or by reaſon of the colour of his hair and complexion. Idumea derives its name from Edom, and is often called in ſcripture the land of Edom. See the next article.

Edom, or Idumæa (anc. geog.), a diſtrict of Arabia Petræa; a great part alſo of the ſouth of Judæa was called Idumæa, becauſe occupied by the Idumæans, upon the Jewiſh captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extenſive, from the march of the Iſraelites, in which they compaſſed it the ſouth eaſtwards, till they came to the country of the Moabites. Within this compaſs lies mount Hor, where Aaron died; marching from which the Iſraelites fought with king Arad the Canaanite, who came down the wilderneſs againſt them (Moſes). And this is the extent of the *Idumæa Propria*, lying to the ſouth of the Dead Sea; but in Solomon's time extending to the Red Sea (1 Kings ix. 26.)

EDMUND I. and II. See *(Hiſtory of)* ENGLAND.

1 Definition. EDUCATION may be defined, that ſeries of means by which the human underſtanding is gradually enlightened, and the diſpoſitions of the human heart are formed and called forth between earlieſt infancy and the period when we conſider ourſelves as qualified to take a part in active life, and, ceaſing to direct our views ſolely to the acquiſition of new knowledge or the formation of new habits, are content to act upon the principles which we have already acquired.

2 Particulars comprehended under the definition. This comprehends the circumſtances of the child in regard to local ſituation, and the manner in which the neceſſaries and conveniences of life are ſupplied to him; the degree of care and tenderneſs with which he is nurſed in infancy; the examples ſet before him by parents, preceptors, and companions; the degree of reſtraint or licentiouſneſs to which he is accuſtomed; the various bodily exerciſes, languages, arts, and ſciences, which are taught him, and the method and order in which they are communicated; the moral and religious principles which are inſtilled into his mind; and even the ſtate of health which he enjoys during that period of life.

3 Various modes of education have prevailed. In different periods of ſociety, in different climates, and under different forms of goverment, various inſtitutions have naturally prevailed in the education of youth; and even in every different family, the children are educated in a different manner, according to the differences in the ſituation, diſpoſitions, and abilities, of the parents. The education of youth being an object of the higheſt importance, has not only engaged the anxious care of parents, but has likewiſe often attracted the notice of the legiſlator and the philoſopher.

4 Plan. What our readers have therefore a right to expect from us on this article is, 1ſt, That we give an account of ſome of the moſt remarkable inſtitutions for the education of youth which have been legally eſtabliſhed or have accidentally prevailed among various nations and in various periods of ſociety. 2dly, That we alſo give ſome account of the moſt judicious and the moſt fanciful plans which have been propoſed by thoſe authors who have written on the ſubject of education. And, laſtly, that we venture to preſent them with the reſult of our own obſervations and recollections on this important head.

5 Education in a ſavage ſtate. In the infancy of ſociety, very little attention can be paid to the education of youth. Before men have riſen above a ſavage ſtate, they are almoſt entirely the creatures of appetite and inſtinct. The impulſe of appetite hurries them to propagate their ſpecies. The power of inſtinctive affection is often, though not always, ſo ſtrong as to compel them to preſerve and nurſe the fruit of their embraces. But even when their wants are not ſo urgent, nor their hearts ſo deſtitute of feeling, as to prompt them to abandon their new-born infants to the ferocity of wild beaſts or the ſeverity of the elements, yet ſtill their uncomfortable and precarious ſituation, their ignorance of the laws of nature, their deficiency of moral and religious principles, and their want of dexterity or ſkill in any of the arts of life, all theſe together muſt render them unable to regulate the education of their children with much attention or ſagacity. They may relate to them the wild inconſiſtent tales in which all their notions concerning ſuperior beings and all their knowledge of the circumſtances and tranſactions of their anceſtors are contained; they may teach them to bend the bow, to point their arrows, to hollow the trunk of a tree into a canoe, and to trace the almoſt imperceptible path of an enemy or a wild beaſt over dreary mountains or through intricate foreſts: but they cannot impreſs their minds with juſt ideas concerning their ſocial relations, or concerning their obligations to a Supreme Being, the framer and upholder of nature: they teach them not to repreſs their irregular appetites, nor to reſtrain the ſallies of paſſion when they exceed juſt bounds or are improperly directed; nor can they inform their underſtandings with very accurate or extenſive views of the phenomena of nature. Beſides, they know not how far implicit obedience to his parents commands is to be required of the boy or youth, nor how far he ought to be left to the guidance of his own reaſon or humour. Among ſavages the influence of parental authority ſoon expires, nor is the parent ſolicitous to maintain it. As the eagle expels his young from his lofty neſt as ſoon as they become able to ſupport themſelves in the air; ſo the ſavage generally ceaſes to care for his child, or aſſume any power over him, as ſoon as he becomes capable of procuring the means neceſſary for his own ſubſiſtence. Savages being ſcarce connected by any ſocial ties, being unacquainted with the reſtraint of civil laws, and being unable to contribute in any great degree to the maintenance or protection of one another; each individual among them, as ſoon as he attains that degree of ſtrength and dexterity which may enable him to procure the neceſſaries of life, ſtands ſingle and alone, independent on others, and ſcorning to ſubmit to their commands. The parent, conſcious of his inability to confer any important benefits on his child, after he has advanced even a very ſhort way towards manhood, no longer endeavours to controul his actions; and the child, proud of his independence, ſcarce ſubmits to aſk his parent's advice. And even before reaching this period of independence, ſo few are the benefits which parents can beſtow (being confined to ſupplying the neceſſaries of life, and communicating the knowledge of a very few of the rudeſt ſimpleſt arts), that children regard them with little deference, nor do *they* always inſiſt on implicit ſubmiſſion. Want of natural affection, and conſciouſneſs of ſuperior ſtrength, often prompt the parent to abuſe the weakneſs of his child. Yet though ſmall the ſkill with which the ſavage can cultivate the underſtanding or form the diſpoſitions of his child, though few the arts which he can teach him, and though not very reſpectful or ſubmiſſive the obedience or deference which he requires; yet is there one quality of mind which the ſavage is more careful to inſpire than thoſe parents who are directed in educating their children by all the lights of civilized ſociety. That quality is indeed abſolutely neceſſary to fit the ſavage for his ſituation; without it, the day on which he

ceaſed to enjoy the protection of his parents would moſt probably be the laſt day of his life: That quality is Fortitude. We may perhaps think, that the hardſhips to which the young ſavage is from the period of his birth unavoidably expoſed, might be enough to inſpire him with fortitude; but, as if theſe were inſufficient, other means are applied to inſpire him with what the Stoics have regarded as the firſt of virtues. He is compelled to ſubmit to many hardſhips unneceſſary, but from a view to this. Children are there called to emulate each other in bearing the ſevereſt torments. Charlevoix relates, that he has ſeen a boy and girl bind their arms together, place a burning coal between them, and try who could longeſt endure without ſhrinking the pain to which they thus expoſed themſelves.

6 The ſavage indebted chiefly to nature and circumſtances for his education.

Still, however, the young ſavage owes his education rather to nature and to the circumſtances in which he is placed, and the accidents which befal him, than to the kindneſs or prudence of his parents. Nature has endowed him with certain powers of underſtanding, ſentiments, ſenſations, and bodily organs; he has been placed in certain circumſtances, and is expoſed to a certain train of events; and by theſe means chiefly, not by the watchful induſtry of inſtructors, does he become ſuch as he appears when he has reached the years of maturity.

7 Education in an improved ſtate of ſociety.

But man was not deſigned by his wiſe and beneficent Creator to remain long in a ſavage ſtate; the principles of his nature incline him to ſocial life. Reaſon, diſtinguiſhing the ſuperior advantages to be enjoyed in ſociety, concurs with the ſocial principle in his breaſt, in prompting him to ſeek the company and converſation of others of the human race. When men enter into ſociety, they always unite their powers and talents, in a certain degree, for the common advantage of the ſocial body. In conſequence of this, laws come in time to be inſtituted; new arts are invented; progreſs is made in the knowledge of nature; moral duties are better underſtood and defined; juſter ideas are gradually acquired of all our ſocial relations; friendſhip, love, filial, parental, and conjugal affection, all are heightened and refined. All theſe advantages do not inſtantly reſult from mens entering into a ſocial ſtate; the improvement of the human mind, and the civilization of ſociety, are gradual and progreſſive: But as it is natural for men to unite in a ſocial ſtate, ſo it is no leſs natural for ſociety to be gradually improved and civilized till it attain an high degree of perfection and refinement.

8 Attention to the education of youth a natural conſequence of civilization.

When men have attained to ſuch knowledge and improvement as to be intitled to a more honourable appellation than that of ſavages, one part of their improvements generally conſiſts in their becoming more judicious and attentive in directing the education of their youth. They have now acquired ideas of dependence and ſubordination; they have arts to teach and knowledge to communicate; they have moral principles to inſtil; and have formed notions of their relation and obligations to ſuperior powers, which they are deſirous that their children ſhould alſo entertain. Their affection to their offspring is now alſo more tender and conſtant. We obſerve at preſent in that ſtate of ſociety in which we live, that the poor who can ſcarce earn for themſelves and their children the neceſſaries of life, are generally leſs ſuſceptible of parental affection, in all its anxious tenderneſs, than the rich, or thoſe whom Providence hath placed in eaſy circumſtances; and we may make uſe of this fact in reaſoning concerning the different degrees of the ſame affection felt by the ſavage and the member of a civilized ſociety. The ſavage may be conſidered as the poor man, who with difficulty procures the neceſſaries of life even for himſelf; the other, as the man in affluent circumſtances, who is more at leiſure to liſten to the voice of tender and generous affection.

In this improved ſtate of ſociety, the education of youth is viewed as an object of higher importance. The child is dearer to his parent; and the parent is now more capable of cultivating the underſtanding and rectifying the diſpoſitions of his child. His knowledge of nature, and his dexterity in the arts of life, give him more authority over a child than what the ſavage can poſſeſs. Obedience is now enforced, and a ſyſtem of education is adopted; by means of which the parent attempts to form his child for acting a part in ſocial life. Perhaps the legiſlature interferes; the education of the youth is regarded as highly worthy of public concern; it is conſidered that the fooliſh fondneſs or the unnatural caprice of parents may, in the riſing generation, blaſt the hopes of the ſtate.

9 Public eſtabliſhments for education among the ancients.

In reviewing ancient hiſtory, we find that this actually took place in ſeveral of the moſt celebrated governments of antiquity. The Perſians, the Cretans, and the Lacedemonians, were all of them too anxious to form their youth for diſcharging the duties of citizens to entruſt the education of the children ſolely to the parents. Public eſtabliſhments were formed among thoſe nations, and a ſeries of inſtitutions enacted, for carrying on and regulating the education of their youths: Not ſuch as our European univerſities, in which literary knowledge is the ſole object of purſuit, the ſtudent is maintained ſolely at his parents expence, and attends only if his parents think proper to ſend him; but of a very different nature, and on a much more enlarged plan.

10 Among the ancient Perſians.

The Perſians, according to the elegant and accurate account delivered by Xenophon in the beginning of his Cyropædia, divided the whole body of their citizens into four orders; the boys, the youth, the full-grown men, and thoſe who were advanced beyond that period of life during which military ſervice was required. For each of theſe orders particular halls were appropriated. Each of them was ſubjected to the inſpection of twelve rulers. The adults and the ſuperannuated were required to employ themſelves in the performance of particular duties, ſuitable to their age, their abilities, and their experience; while the boys and the youth were engaged in ſuch a courſe of education as ſeemed likely to render them worthy and uſeful citizens.

The boys were not employed, in their places of inſtruction, in acquiring literary accompliſhments; for to ſuch the Perſians were ſtrangers. They went thither to learn juſtice, temperance, modeſty; to ſhoot the bow, and to lanch the javelin. The virtues and the bodily exerciſes were what the Perſians laboured to teach their children. Theſe were the direct, and not ſubordinate, purpoſes of their ſyſtem of education. The maſters uſed to ſpend the greateſt part of the day in diſpenſing juſtice to their ſcholars; who carried before them actions for thefts, robberies, frauds, and other ſuch grounds of complaint againſt one another.—Such were the means by which the Perſians endeavoured to inſtil, even in early youth, a regard for the laws of natural equity, and for the inſtitutions of their country. Till the age of 16 or 17, the boys were buſied in acquiring thoſe parts of education. At that period they ceaſed to be conſidered as boys, and were raiſed to the order of the youths. After they entered this order, the ſame views were ſtill attended to in the carrying on of their education. They were ſtill enured to bodily labour. They were to attend the magiſtrates, and to be always ready to execute their commands. They were led out frequently to the chace; and on ſuch expeditions they were always headed by the king, as in time of war. Here they were taught to expoſe themſelves fearleſsly to danger; to ſuffer, without repining or complaint, hunger, thirſt, and fatigue; and to content themſelves with the coarſeſt, ſimpleſt fare, for relieving the neceſſities of nature. In ſhort, whether at home or out on ſome hunting expedition, they were conſtantly employed in acquiring new ſkill and dexterity in military exerciſes, new vigour of mind and body, and confirmed habits of temperance, fortitude, abſtinence, patience, patriotiſm, and noble integrity. After ſpending ten years in this manner, their courſe of education was completed; they were admitted into the claſs of the adults, and were eſteemed qualified for public offices. It muſt not eſcape our notice, that the citizens were not compelled to ſend their children to paſs through this courſe of education in the public halls; but none except ſuch as paſſed through this courſe of education were capable of civil power, or admitted to participate in public offices or public honours.

Such are the outlines of that ſyſtem of education which Xenophon repreſents as publicly eſtabliſhed among the Perſians. Were we able to preſerve in a tranſlation all the manly and graceful ſimplicity of that enchanting author, we would have offered to the peruſal of our readers the paſſage in which he has deſcribed it; but conſcious of being inadequate to that taſk, we have preſumed only to extract the information which it contains.

11
Remarks on Xenophon's account of Perſian education.

Perhaps, however, this ſyſtem of education did not ſubſiſt preciſely as the eloquent diſciple of Socrates deſcribes it among that rude and ſimple people. On other occaſions he has commemorated ſuch inſtances of their barbarity, as would tempt us to think them incapable of ſo much order and ſo much wiſdom. Perhaps, as the diſcoverers of the new world have ſometimes conferred on the inhabitants of that hemiſphere, in the accounts of them with which they entertained their friends in Europe, amazing degrees of moral and political wiſdom, of ſkill and dexterity in the arts, of induſtry and valour, which thoſe uncivilized children of nature were afterwards found not to poſſeſs; ſo the Athenian philoſopher has alſo aſcribed to the Perſians prudence and attention in regulating the education of their youth beyond what people in ſo rude a ſtate can poſſibly exert.

But if we examine into the principles on which this ſyſtem of education proceeds, without concerning ourſelves whether it once actually prevailed among the Perſians, or is the production of the fine imagination of Xenophon, we will find it peculiarly ſuitable for a nation juſt emerging from the rudeneſs and ignorance of barbarity to a knowledge of ſocial and civil relations, and of the duties connected with ſuch relations. They have ſacrificed their independence to obtain the comfort and ſecurity of a ſocial ſtate. They now glory in the appellation of citizens, and are deſirous to diſcharge the duties incumbent on a citizen. They muſt inform their children in the nature of their ſocial relations, and impreſs them with habits of diſcharging their ſocial duties; otherwiſe the ſociety will ſoon be diſſolved, and their poſterity will fall back into the ſame wild miſerable ſtate from which they have emerged. But perhaps the circumſtances, or abilities, or diſpoſitions of individuals, render them unequal to this weighty taſk. It becomes therefore naturally an object of public care. The whole ſocial body find it neceſſary to deliberate on the moſt proper means for diſcharging it aright. A plan of education is then formed; the great object of which is, to fit the youth for diſcharging the duties of citizens. Arts and ſciences are hitherto almoſt wholly unknown: and all that can be communicated to the youth is only a ſkill in ſuch exerciſes as are neceſſary for their procuring ſubſiſtence, or defending themſelves againſt human enemies or beaſts of prey; and habits of performing thoſe duties, the neglect of which muſt be fatal to the ſociety or the individual.

Such is the ſyſtem of education which we have ſurveyed as eſtabliſhed among the Perſians; and perhaps we may now be leſs ſuſpicious than before of Xenophon's veracity. It appears natural for a people who have reached that degree of civilization in which they are deſcribed, and have not yet advanced farther, to inſtitute ſuch an eſtabliſhment. Some ſuch eſtabliſhment alſo appears neceſſary to prevent the ſociety from falling back into their former barbarity. It will prevent their virtue and valour from decaying, though it may perhaps at the ſame time prevent them from making any very rapid progreſs in civilization and refinement. Yet the induſtry, the valour, the integrity, and the patriotiſm which it inſpires, muſt neceſſarily produce ſome favourable change in their circumſtances; and that change in their circumſtances will be followed by a change in their ſyſtem of education.

12
Among the Cretans.

The Cretans, too, the wiſdom of whoſe laws is ſo much celebrated in the records of antiquity, had a public eſtabliſhment for the education of their youth. Minos, whom they revered as their great legiſlator, was alſo the founder of that eſtabliſhment. Its tendency was ſimilar to that of the courſe of education purſued among the Perſians,—to form the ſoldier and the citizen. We cannot preſent our readers with a very particular or accurate account of it; but ſuch as we have been able to procure from the beſt authorities we think it our duty to lay before them.

The Cretans were divided into three claſſes; the boys, the youth, and the adults. Between ſeven and ſeventeen years of age, the boy was employed in learning to ſhoot the bow, and in acquiring the knowledge of his duties as a man and a citizen, by liſtening to the converſation of the old men in the public halls, and obſerving their conduct. At the age of ſeven, he was conducted to the public halls to enter on this the gods. At the age of ſeventeen he was enrolled among the youth. Here his education was ſtill continued on the ſame plan. He was to exerciſe himſelf among his equals in hunting, wreſtling, and the military exerciſes; and while thus engaged, his ſpirits were rouſed and animated by ſtrains of martial muſic played on ſuch inſtruments as were then in uſe among the inhabitants of Crete. One part of the education of the Cretan youth, in which they were particularly deſirous to excel, was the Pyrrhic dance; which was the invention of a Cretan, and conſiſted of various military evolutions performed to the ſound of inſtruments.

Such were the principles and arts in which the Cretan legiſlature directed the youth to be inſtructed. This courſe of education could not be directed or ſuperintended by the parent. It was public, and carried on with a view to fit the boy for diſcharging the duties of a citizen when he ſhould attain to manhood.

13 Remarks on the Cretan education. It is eaſy to ſee, that ſuch a ſyſtem of education muſt have been inſtituted in the infancy of ſociety, before many arts had been invented, or the diſtinctions of rank had ariſen; at a time when men ſubſiſted in a conſiderable degree by hunting, and when the intercourſe of nations was on ſuch a footing, that war, inſtead of being occaſional, was the great buſineſs of life. Such a ſyſtem of life would then naturally take place even though no ſage legiſlator had ariſen to regulate and enforce it.

14 Among the Lacedemonians. Lycurgus, the celebrated lawgiver of Lacedemon, thought it neceſſary to direct the education of youth in a particular manner, in order to prepare them for paying a ſtrict obedience to his laws. He regarded children as belonging more properly to the ſtate than to their parents, and wiſhed that patriotiſm ſhould be ſtill more carefully cheriſhed in their breaſts than filial affection. The ſpirit of his ſyſtem of education was pretty ſimilar to that of thoſe which we have juſt viewed as ſubſiſting among the Perſians and the Cretans.

As ſoon as a boy was born, he was ſubmitted to the inſpection of the elders of that tribe to which his parents belonged. If he was well ſhaped, ſtrong, and vigorous, they directed him to be brought up, and aſſigned a certain portion of land for his maintenance. If he was deformed, weak, and ſickly, they condemned him to be expoſed, as not being likely ever to become an uſeful citizen. If the boy appeared worthy of being brought up, he was entruſted to the care of his parents till he attained the age of ſeven years; but his parents were ſtrictly charged not to ſpoil either his mind or his bodily conſtitution by fooliſh tenderneſs. Probably, too, the ſtate of their manners was at that time ſuch as not to render the injunction peculiarly neceſſary.

At the age of ſeven, however, he was introduced to a public claſs, conſiſting of all the boys of the ſame age. Their education was committed to maſters appointed by the ſtate; and what was chiefly inculcated on them in the courſe of it, was ſubmiſſive obedience and reſpect to their ſuperiors; quickneſs and brevity in might be expoſed. One of the means uſed to form them to habits of activity and addreſs, was to permit, nay, to direct them to commit little acts of theft; which, if they performed them ſo dexterouſly as to avoid detection, they might afterwards boaſt of as noble exploits: but if detected in ſuch enterpriſes, the aukward artleſs boy was expoſed both to puniſhment and diſgrace. To avoid the puniſhment and diſgrace incurred by being detected in an act of theft, the Spartan boy would often ſuffer with unſhrinking fortitude the ſevereſt torments. It is related of one of them, that rather than be diſcovered with a young fox under his cloak, which he had ſtolen, he ſuffered the little animal to tear open his bowels. Not content with beholding the children ſuffer by ſubmitting voluntarily to ſuch hardſhips, the Spartans alſo endeavoured to form them to fortitude, by whipping them on their religious feſtivals, ſometimes with ſuch ſeverity that they expired under the laſh. The Lacedemonian youth were alſo taught ſuch bodily exerciſes, and the uſe of ſuch warlike weapons, as were neceſſary to render them expert and ſkilful ſoldiers.

15 Remarks. They too, as well as the Cretans and Perſians, among whom we have ſeen that ſomewhat ſimilar modes of education prevailed, were to be citizens and ſoldiers; not huſbandmen, mechanics, artiſts, merchants, &c. Therefore the mode of education eſtabliſhed among them was ſimple and uniform. Its aim was, to make them acquainted with the nature of their ſocial duties, and to form them to ſuch vigour of body and ſuch firmneſs of mind as might render them fit for the ſtation in which they were to be placed, and adequate to the part which they were to act. This eſtabliſhment for education was perfectly conſiſtent with the other parts of that legiſlature which was inſtituted by Lycurgus. Youth educated among the Lacedemonias could hardly fail to become worthy members of that ſingular republic. Let us not however regard the Spartans as *ſingularly* inhumane in their treatment of youth. Let us reaſcend, in imagination, to that period in the progreſs of ſociety from rudeneſs to refinement, to which they had attained when Lycurgus aroſe among them. What were then their circumſtances, their arts and manners, their moral principles, and military diſcipline? Not very different from thoſe which the laws of Lycurgus rendered ſo long ſtationary among them. He, no doubt, rectified ſome abuſes, and introduced greater order and equality. But man is not to be ſo eaſily metamorphoſed into a new form. As you cannot, at once, raiſe an acorn to a venerable oak; ſo neither will you be able to change the ſavage, at once, into the citizen. All the art or wiſdom of Lycurgus, even though aſſiſted by all the influence of the prophetic Apollo, could never have eſtabliſhed his laws among his countrymen, had not their character and circumſtances previouſly diſpoſed them to receive them. But, grant this, and you muſt, of conſequence, allow, that what to us may appear cruel and inhumane, muſt have affected their feelings in a different manner. The change introduced in the treatment of youth by the eſtabliſh-

ment of this ſyſtem of education was probably recommended by its being more humane than what before prevailed. Corrupted as are our manners, and effeminate our modes of education; yet we would not perhaps act wiſely in laying them aſide, to adopt in their ſtead thoſe of ancient Sparta. But the Spartan education was peculiarly well fitted to form citizens for the republic of Lycurgus; it was happily adapted to that ſtate of ſociety in which it was introduced. And, if we ſhould enquire by what means Lycurgus was enabled to fix the arts, the manners, and in ſhort the civilization of his country, for ſo long a period in a ſtationary ſtate; we would perhaps find reaſon to aſcribe that effect, to the public eſtabliſhment which he inſtituted for the education of youth; to his confining the Spartan citizens to the profeſſion of arms, and aſſigning all ſervile offices to the Helots; and to his prohibiting the uſe of gold and ſilver. Among theſe however his eſtabliſhment for education occupies the chief place. Never was any ſtate adorned with more patriotic citizens than thoſe of Sparta. With them every private affection ſeemed to be ſwallowed up by the *amor patriæ:* the love of their country was at leaſt their ruling paſſion. Pœdaretes being rejected when he offered himſelf a candidate for a ſeat among the council of three hundred, returned home, rejoicing that there were in Sparta no fewer than three hundred whom his countrymen found reaſon to regard as better citizens than himſelf. This was not a ſeeming joy, aſſumed to conceal the pain which he ſuffered from the diſappointment; it was heartfelt and ſincere. Such were the effects of their ſyſtem of education.

16
Education among the other nations of antiquity.

When we turn our eyes from the Perſians, the Cretans, and the Spartans, to the other nations of antiquity; we no where behold ſo regular a ſyſtem of public education. Among the Athenians and the Romans, the laws did not deſcend to regulate in ſo particular a manner the management of the youth. Theſe nations gradually emerged from a ſtate of the rudeſt barbarity, to that poliſhed, enlightened, and civilized ſtate which rendered them the glory and the wonder of the heathen world: but in no part of their progreſs from the one ſtate to the other do we find any ſuch eſtabliſhment ſubſiſting among them. So various, however, are the circumſtances which form and diverſify the character of nations, that we cannot reaſonably conclude, becauſe no ſuch eſtabliſhments exiſted among the Athenians and Romans, that therefore their exiſtence was unnatural among thoſe nations who poſſeſſed them. But though the education of youth was managed in a different manner among theſe and moſt other nations in the ancient world, than by public eſtabliſhments, which detached children from the care of their parents; yet ſtill it was every where regarded as an object of the higheſt importance. As the manners of mankind gradually improved to a ſtate of refinement; as the invention of arts, and the diſcovery of ſcience gradually introduced opulence and luxury; connubial, parental, and filial affection gradually acquired greater ſtrength and tenderneſs. Of conſequence, children experienced more of their parents care; and that care was directed to form them for acting a becoming part in life. According to the circumſtances of each nation, the arts which they cultivated, and the form of government under which they lived; the knowledge which they ſought to communicate to their children, and the habits which they endeavoured to impreſs upon them, were different from thoſe of other nations: And again, according to the different circumſtances, tempers, abilities, and diſpoſitions of parents, even the children of each family were brought up in a manner different from that in which thoſe of other families were managed. The Athenians, the Romans, the Carthaginians, conducted each of them the education of their youth in a different manner, becauſe they had each different objects in view. But having conſidered the moſt ſingular eſtabliſhments for education which prevailed in the ancient world, it ſeems unneceſſary for us to deſcend to a particular account of the manner which every nation, or fantaſtic individual, thought proper to purſue in bringing up their youth. It will probably be more uſeful and entertaining to our readers, if we next preſent them with a view of ſome of the moſt judicious or fanciful plans of education which have been propoſed by the writers on that ſubject.

17
Quinctilian.

One of the moſt reſpectable writers on education among the ancients, is the celebrated Quinctilian. He taught rhetoric in Rome during the reign of Domitian and under ſeveral of the other emperors. When he retired from the exerciſe of his employment as a teacher of rhetoric, he ſpent his leiſure in the compoſition of a treatiſe, not merely on rhetoric, but on the moſt proper means for educating a boy ſo as to render him both an eloquent orator and a good man.

In that valuable treatiſe, he enters into a minute detail of all that appears to him moſt likely to conduce to thoſe important ends.

As ſoon as the boy enters the world, he would have the greateſt care to be uſed in ſelecting thoſe who are to be placed about him. Let his nurſe have no impediment of ſpeech. It will be happy for him, if his parents be perſons of ſenſe and learning. Let his tutor, at leaſt, poſſeſs theſe qualifications. As ſoon as he attains the diſtinct uſe of his organs of ſpeech, let him be initiated in the firſt elements of literature. For as he is capable of diſtinguiſhing and remembering at a very early age; ſo his faculties cannot poſſibly be employed in a more advantageous manner. And even at this early period of life, let maxims of prudence and the firſt principles of morals be inculcated upon his mind by the books which are put into his hands, and even by the lines which he copies in learning the art of writing. The Greek language was to the Romans in the days of Quinctilian, what the Latin and Greek and French are to us at preſent, an acquiſition held indiſpenſably neceſſary to thoſe who aſpired to a liberal education; and Quinctilian judges it proper that the boy ſhould begin his application to letters with the Greek language in preference to his mother tongue.

This judicious writer next examines a queſtion which has been often agitated, Whether a domeſtic or a public education is liable to the feweſt inconveniences, and likely to be attended with the greateſt advantages? And he is of opinion, that in a domeſtic education the boy is in danger of being corrupted by injudicious fondneſs and evil example; is not rouſed by the ſpur of emulation; and is deprived of proper opportunities for acquiring a juſt idea of his own powers, or that are not greatly expoſed to corruption, emulation is rouſed, friendſhips are formed, all the powers of the mind are called forth to act with new vigour, and the youth is prepared for performing his part on the great theatre of the world. Quinctilian, therefore, wiſhes that parents would place their children in public ſeminaries of education.

When a boy is committed to a maſter's care, the maſter's attention muſt be firſt directed to diſcover his diſpoſitions and the extent of his capacity. Of his capacity he will form a favourable judgment, not from his ſprightlineſs, nor even from his quickneſs of apprehenſion; but from his modeſty, docility, and virtuous diſpoſitions. If the boy poſſeſs theſe laſt qualifications, the maſter will rejoice in him, as likely to give him ſatisfaction and do him honour. According to his temper and diſpoſitions, let the boy be treated with mildneſs or ſeverity; but never let ſeverity extend to blows. Let the boy be allured and led, by the moſt artful and inſinuating treatment, to do his duty; there will then be no occaſion to puniſh him for neglecting it.

As Quinctilian's profeſſed object was, not merely to give general directions for forming the heart and cultivating the underſtanding, but to form a particular character in life, the ſcholar and the orator; he finds it neceſſary to enter into minute details concerning the manner in which the boy is to be inſtructed in ſpeaking, writing, grammar, and compoſition; of which it does not appear neceſſary for us to take particular notice in this place. Muſic and geometry, he thinks, ought to make a part of the young orator's ſtudies; as being uſeful to render him accurate in reaſoning, and capable of reliſhing the beauties of the poets. He is alſo of opinion, that the boy ſhould not be confined to one branch of ſtudy, without being allowed to attempt others till he have made himſelf maſter of that. Let ſeveral parts of literature engage his attention by turns: let him dedicate a conſiderable portion of his time to them. He may thus acquire habits of induſtrious application which will remain with him through life.

With the tender attention of a good man, this ſenſible and elegant writer ſtill accompanies his pupil through the courſe of his ſtudies; anxiouſly inſiſts that he be placed under a maſter diſtinguiſhed for purity of morals, and for no mean abilities in his profeſſion; directs his memory to be ſtored with the nobleſt paſſages of the poets, orators, and hiſtorians; and carefully diſcuſſes and refutes thoſe opinions which repreſent genius as above induſtry. The remaining part of his work being employed on the principles of rhetoric, without containing any thing on the ſubject of education in general, it is not neceſſary that we ſhould here preſent an analyſis of it to our readers. But ſince Quinctilian was ſo diſtinguiſhed, not only as a rhetorician, but as an inſtructor of youth, and diſplays ſo much good ſenſe and ſo ſolid a judgment, formed on long experience, in whatever he advances on the ſubject of education; we could not, without extreme negligence, omit taking notice of him under this article, that his ſentiments on any ſubject are intereſting to Britons. His life was dedicated to ſtudy: During a part of it, he was employed in the taſk of inſtructing youth; and among his other works we find a treatiſe on education. He had himſelf been educated according to that plan which has long been eſtabliſhed in the Engliſh univerſities; but with that mode of education he was not ſatisfied. The object of his directions is chiefly to form the ſcholar. He conſidered himſelf as qualified to exhibit a model of "a better education, in extent and comprehenſion far more large, and yet of time far ſhorter, and of attainment far more certain, than any that had yet been in practice." The following is the ſubſtance of his treatiſe.

treatiſe on education.

As the end of learning is to cultivate our underſtandings, and to rectify our diſpoſitions; therefore the deſign of our applying to the ſtudy of languages cannot be merely that we may commit to memory the words of which they conſiſt, or that we may acquire a knowledge of their analogy and ſtructure; but that we may enrich our minds with the treaſures of wiſdom which they contain. But in the preſent modes of education this deſign does not appear to be kept in view. The learner of Latin is burdened with rules, and themes, and verſes, and orations; but no care is taken to make him maſter of the valuable knowledge which the claſſics contain. And when he advances a little farther, he is driven into the thorny paths of logic and metaphyſics. So, when his ſtudies are completed, and he is conſidered as having received a liberal education, he is almoſt as deſtitute of real knowledge as when he firſt entered a ſchool.

But to render learning truly beneficial, inſtead of the ſchool and univerſity education which youth at preſent receive; let the place of both ſchool and univerſity be ſupplied by an academy, in which they may acquire all that is taught at either, except law and phyſic. Let the academy afford accommodation for 150 perſons; 20 of whom may be ſervants and attendants. As many academies as are neceſſary may be afterwards erected on the model of this one. Let the youth who are introduced into this academy begin their ſtudies with learning the principal rules of grammar from ſome good elementary book. In their pronunciation of Latin, let them be taught to follow the pronunciation of the Italians; as that of the Engliſh is indiſtinct, and unſuitable to the genius of the language. Next, read to them ſome entertaining book on education; ſuch as, the three firſt books of Quinctilian in Latin, and Cebes, Plutarch, or ſome other of the Socratic diſcourſes, in Greek; and be careful to ſeize every opportunity of inſpiring them, by ſeaſonable lectures and explanations, with love for learning, admiration of great and virtuous characters, and a diſpoſition to cheerful obedience. At the ſame time, but at a different hour of the day, let them be inſtructed in the rules of arithmetic and the elements of geometry. Between ſupper and bed-time inſtruct them in the principles of religion and the ſacred hiſtory. From the writers on education, our pupils paſs to the authors on agriculture, to Varro, and Columella. Before half theſe authors be read, they cannot but be pretty well qualified to read moſt of the proſe authors in the Latin language; and they may now, with great propriety, learn the uſe of the globes, and make themſelves acquainted with the ancient and modern maps. Let them, about the ſame time, begin the ſtudy of the Greek tongue, and proceed in it as in the Latin: they will not fail to overcome, in a ſhort time, all the difficulties of grammar; after which they will have acceſs to all the treaſures of natural knowledge to be found in Ariſtotle and Theophraſtus. In the ſame manner they may make themſelves acquainted with Vitruvius, Seneca, Mela, Celſus, Pliny, and Solinus. And having thus paſſed through the principles of arithmetic, geometry, aſtronomy, and geography, with a general compact of phyſics; let them next turn their attention to mathematics, in which they may begin with the practical branch of trigonometry, which will ſerve as an introduction to fortification, architecture, and navigation. To teach them the knowledge of nature, and inſtruct them in the arts of life, let them have the aſſiſtance and inſtructions, not merely of maſters who are acquainted only with books, but of men whoſe ſkill has been obtained by actual practice, even of artiſts and mechanics. Next, let the poets obtain their attention; and they will now read them with eaſe and pleaſure. From the poets let your pupils proceed to the moraliſts; and, after acquainting themſelves with them, they may be allowed the entertainment of ſome of the beſt Greek, Latin, and Italian, dramatic compoſitions. From theſe let them proceed to politics: let them here ſtudy the law of Moſes, the admirable remains of the ancient lawgivers of Greece, the Roman tables, edicts, and pandects, concluding with the inſtitutions of their mother country. Now let them be more particularly inſtructed in the principles of theology; for by this time they may have acquired the Hebrew language, together with the Chaldee and the Syriac dialect, and may therefore read the ſcriptures in their original language. When their minds are thus furniſhed, they will be able to enter into the ſpirit of the nobleſt hiſtorians and poets. To get by heart, and repeat in a proper manner, paſſages from the writings of ſome of theſe, will have the happieſt effects in elevating their genius. Let this ſtately edifice be crowned with logic and rhetoric. Far different would be the effects of ſuch a courſe of education, from thoſe produced by any which is at preſent purſued. We ſhould then ſee abler writers, more eloquent ſpeakers, and wiſer ſtateſmen. Similar to this, probably, was the courſe taught in the famous ſchools of Pythagoras, Plato, Iſocrates, and Ariſtotle. This would unite the advantages of an Athenian and a Spartan education: for our pupils ſhould be taught the exerciſes of wreſtling and fencing, and the whole military diſcipline.

19 Remarks. Such are the ideas of our admired Milton on the ſubject of education. An enthuſiaſtic admirer of the ſciences, arts, and inſtitutions of Greece and Rome; from his religious and political principles, no friend to the univerſities; it was natural for a man of his learning and ingenuity, in an age of innovation, and influenced by ſuch prejudices, to form ſuch a project as that which we have ſurveyed. He ſeems not to have reflected, that it is neceſſary for children to be long occupied in obtaining a familiar acquaintance with words, before they can gain from books any knowledge of things; overlooking this circumſtance, and perceiving plainly that the mode of education which then prevailed confined the attention of youth almoſt wholly to words, he could not but regard the ſcheme which he propoſed as likely to produce very happy effects. His obſervation, that the appearances of external nature are among the firſt objects which attract the attention of youth, which he communicates by directing his pupils to peruſe the writers on agriculture and natural hiſtory as near the beginning of their ſtudies as poſſible; if not altogether juſt, yet muſt be allowed to be nearly ſo. Perhaps human actions and paſſions, and the ſeries of events which happen around us, are, by the time at which we begin our application to learning, the objects which moſt frequently and ſtrongly engage our attention: But the appearances of external nature are at leaſt the next object of our regard.

20 Locke's Treatiſe on education. Mr Locke, to whoſe abilities and noble deſire to be uſeful to the world his country is ſo much indebted, has written, among other things, on the education of youth. He was capable of thinking for himſelf; but more deſirous of rendering himſelf uſeful, than of being admired for ſingularity. He is, therefore, an author to whom we ought to liſten, at leaſt, with reſpectful attention. If Quinctilian and Milton had been employed as teachers of youth, Mr Locke had been converſant with the world, had inquired into the principles of human nature, and had no doubt endeavoured to examine without prejudice the effects of thoſe modes of education of which he diſapproves. When we conſider, that, to render himſelf uſeful to the riſing generation, he could deſcend from the heights of ſcience to tranſlate the fables of Æſop, and to perform other humble taſks in literature, which a philoſopher of leſs benevolence and virtue would have diſdained; we cannot but look with veneration and gratitude on ſo exalted a character. In his Treatiſe on Education, the two great objects which Mr Locke keeps in view are, 1ſt, To preſerve and ſtrengthen the bodily conſtitution; 2dly, To inform the underſtanding with uſeful knowledge, and to cheriſh good diſpoſitions in the heart.

21 Bodily conſtitution. In his directions on the firſt of theſe heads, he ſeems extremely anxious to prevent parents and others in whoſe hands children are placed, from injuring them by ill-directed tenderneſs. Plain fare, ſimple and light cloathing, abſtinence from phyſic and from ſtrong liquors, he earneſtly recommends as the moſt judicious means for preſerving and confirming the health of the child. In all his gratifications let the ſtricteſt moderation be obſerved. If you permit him to indulge pretty freely in ſleep, at leaſt cauſe him to get up at an early hour in the morning. In one thing, however, few parents will be willing to comply with Mr Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even expreſſes a wiſh, that his ſhoes were always kept in ſuch a condition as to admit water freely. This he thinks likely to fortify the conſtitution of the body in ſuch a manner, as to render him leſs liable, in the courſe of life, to ſuch diſeaſes as ariſe from any unuſual expoſure to wetneſs or cold, than others whoſe

feet have been more carefully kept dry. Though he had proſecuted his ſtudies with a deſign to enter into the profeſſion of phyſic, yet ſo unfavourable an opinion did he entertain of the effects produced by medical preparations on the human conſtitution, that he earneſtly inſiſts on the parent to beware of adminiſtering any of them to his child. From the deſire which Mr Locke diſcovers to have children expoſed to hardſhips, and reſtrained from indulgence, in order to confirm the health and invigorate the conſtitution, we may conjecture him to have been an admirer of that ſevere mode of education which uſually prevails in the earlier periods of the exiſtence of ſociety. He ſeems to have thought, that if a boy be brought up like a Huron or a Spartan, he muſt neceſſarily become robuſt and healthy; without reflecting, that of thoſe children who are ſubjected to ſuch a courſe of education, too great a proportion are unable to ſurvive it: ſuch is the natural delicacy of the human frame.

22
Cultivation of the powers of the mind.

When he turns his attention to the cultivating of the underſtanding, and the forming of the diſpoſitions, Mr Locke ſtill deſervedly claims the regard of the parent and the preceptor. With a virtuous indignation he reprobates that negligence and folly by which we generally corrupt the heart and ſpoil the temper of children, even in the period of infancy; ſo as to render them incorrigible when they advance farther in life. Their appetites are pampered, all their deſires are gratified; and if we are at any time diſpoſed to refuſe what they aſk, they have an all-powerful engine to compel our compliance with their wiſhes. They aſſail us with tears; and we then yield to their requeſts, however hurtful to themſelves or inconvenient to us. We often ſtudiouſly inſtruct them in vicious tricks, and call forth their evil paſſions. At ſo early an age, their rage or cunning can ſcarcely injure us; and we reflect not that habits of peeviſhneſs and deceit muſt be peculiarly hurtful to themſelves.

But though all the fooliſh deſires of children ought not to be gratified, and though we ſhould carefully avoid leading them into any bad habit; yet it is not neceſſary nor prudent to treat them with harſhneſs or ſeverity. Let them be formed to obedience from their earlieſt years: let them be accuſtomed to ſubmit implicitly to the direction of thoſe on whom they depend. But beware of ſouring their temper and depreſſing their ſpirits by harſhneſs: and on the other hand, remember, that it is no leſs improper to give the boy a habit of neglecting his duty except when he is allured to it by the hopes of reward. As he advances towards manhood, and attains the uſe of reaſon; you may admit him to greater familiarity, and allow him to follow his own inclinations more than at an earlier period: and if, inſtead of indulging all his freaks in childhood, you have carefully accuſtomed him to obedience and ſubmiſſion, without enforcing theſe by improper means, he will now be able to regulate his conduct with ſome degree of prudence.

But while caution is to be uſed in beſtowing rewards and inflicting puniſhments; ſtill rewards and puniſhments are indiſpenſably neceſſary in the management of the child. Inſpire your boy with a ſenſe of ſhame, and with a generous thirſt for praiſe. Careſs and honour him when he does well; treat him with neglect when he acts amiſs. This conduct will produce much better effects than if you were at one time to chide and beat him; at another, to reward him with a profuſion of ſweetmeats and playthings.

Think not that children are to be taught propriety of conduct by loading their memory with rules, directing them how to act on every particular occaſion. Burden them not with rules, but impreſs them with habits.

Be not deſirous of forming them at too early an age, to all that politeneſs and propriety of manners which you wiſh to diſtinguiſh them when they become men. Let them be taught an eaſy, graceful carriage of body: but give yourſelf no concern, though they now and then blunder againſt the punctilios of good-breeding; time will correct their aukwardneſs.

With regard to that important queſtion, whether children ought to be ſent to a public ſchool, or are likely to be better trained up in a domeſtic education? ſo impoſſible is it for one maſter to extend his attention to a number of boys, and ſo likely is the contagion of vice to be caught among the crowd of a public ſchool, that a private ſeems more favourable than a public education to virtue, and ſcarce leſs favourable to learning.

When you reſolve to give your ſon a domeſtic education, be careful to regulate that domeſtic education in a judicious manner. Keep him at a diſtance from evil example: chooſe the moſt favourable ſeaſons for communicating inſtruction: ſtrictly enforce obedience; but never by blows, except in caſe of obſtinacy which you find otherwiſe incurable. If his engagements in life prevent the parent from ſuperintending and directing his ſon's education perſonally, let him commit him to the care of a virtuous and judicious tutor. Let the tutor be rather a man of experience in the world than of profound learning; for it is more neceſſary that the pupil be formed for conducting himſelf with prudence in the world, and be fortified againſt thoſe temptations to which he will be expoſed when he enters upon active life, than that his head be ſtuffed with Latin and logic.

Here Mr Locke, notwithſtanding that his own mind was ſtored with the treaſures of Grecian and Roman literature, takes occaſion to declare himſelf pretty freely againſt that application to ancient learning, which was then indiſpenſably required in the education of youth. He conſiders languages and philoſophy as rather having a tendency to render the youth unfit for acting a prudent and becoming part in life, than forming for it: and he therefore inſiſts that theſe ſhould be but in a ſubordinate degree the objects of his attention.

Let the tutor encourage the child under his care to a certain degree of familiarity; let the pupil be accuſtomed to give his opinon on matters relative to himſelf: let him be taught juſtice, by finding injuſtice to others prejudicial to himſelf; let him be taught liberality, by finding it advantageous; let him be rendered ſuperior to teazing his parents or tutor with complaints, by finding his complaints unfavourably received. That you may teach him to reſtrain every fooliſh or irregular deſire, be ſure never to indulge his wiſhes, ſave when you find the indulgence proper for him, and convenient for yourſelf. Curioſity, however, is a principle which ought to be induſtriouſly rouſed in the breaſt of the child, and cheriſhed there by meeting always the readieſt gratification. However you may oppoſe the boy's inclinations in other things, yet refuſe him not a proper portion of recreation: let him indulge in play, while he continues to play with keenneſs and activity; but ſuffer him not to loiter about in liſtleſs indolence. To reſtrain your child from fool-hardy courage, point out to him the dangers to which it expoſes him: to raiſe him above timorous cowardice, and inſpire him with manly fortitude; accuſtom him from the earlieſt period of life to an acquaintance with ſuch things as he is moſt likely to be afraid of: ſubject him now and then to pain, and expoſe him to danger; but let ſuch trials be judiciouſly conducted.

Idleneſs or curioſity ſometimes leads children to cruelty in their treatment of ſuch animals as are placed within their power. Dogs, cats, birds, and butterflies, often ſuffer from their inhumanity. But when they ſeem inclined to ſuch cruelty, let them be carefully watched, and let every means be uſed to awake their hearts to generous ſenſibility. Allow them to keep tame birds, dogs, &c. only on condition of their uſing them with tenderneſs. Perhaps this unhappy diſpoſition to cruelty is occaſioned, or at leaſt foſtered, by people's laughing when they behold the impotent efforts of children to do miſchief; and often going ſo far as even to encourage them in maltreating thoſe creatures which are within their reach. We entertain them, too, with ſtories of fighting and battles; and repreſent characters diſtinguiſhed for atrocious acts of inhumanity as great and illuſtrious. But let ſuch practice be carefully refrained from, if you wiſh to inſpire your child with generous and humane ſentiments. Teach him gentleneſs and tenderneſs, not only to brute animals, but alſo to ſervants and companions.

Curioſity is to be rouſed and cheriſhed in the breaſt of the child: but by what means? Anſwer his inquiries readily: though his queſtions be put in aukward language, let not that hinder you from attending to the objects of them. Curioſity is natural to the human mind; and if you repreſs not the curioſity of the child, he will often be moved by its impulſe to the purſuit of knowledge. Let him find his eagerneſs in the purſuit of knowledge, a ſource of applauſe and eſteem. Avoid the folly of thoſe who ſport with the credulity of children, by anſwering their queſtions in a ludicrous or deceitful manner.

You muſt, however, not only liſten with obliging attention to his queſtions, and ſtrive to gratify his curioſity; but even whenever he attempts to reaſon on ſuch ſubjects as are offered to his obſervation, be careful to encourage him: praiſe him if he reaſons with any degree of plauſibility; even if he blunders, beware of ridiculing or laughing at him. With regard to the boy's play-things: while you indulge him freely in innocent diverſions, give him ſuch play-things as may be neceſſary in the amuſements in which he engages, provided they be ſuch as he cannot make himſelf; but it will be ſtill better for him to exerciſe his dexterity and ingenuity in making them himſelf.

After throwing out theſe things concerning the general principles on which education ſhould be carried on, Mr Locke next proceeds to thoſe particular parts of knowledge in which he thinks every young gentleman ought to be inſtructed. In virtue, wiſdom, breeding, and learning, he comprehends all that is neceſſary to enable his pupil to act a reſpectable part in life.

In forming the boy to virtue, the firſt thing to be done, is to inform him of the relation ſubſiſting between human creatures and a ſupreme independent Being, their creator, preſerver, and governor; and to teach him, that obedience and worſhip are due to that Being. But when you inform the child of the exiſtence of an inviſible Being, beware of impreſſing his mind with any notions concerning ſpirits or goblins, which may render him incapable of bearing darkneſs or ſolitude. In infancy our minds are, by the indiſcretion of thoſe about us, generally impreſſed with ſuch prejudices concerning a thouſand frightful forms, ever ready to aſſail or haunt us under the ſhade of night, that we become incapable of manly fortitude during the courſe of life: the ſoldier who will boldly face death in the field of battle, ſhall perhaps tremble and take to flight at the ruſtling of a few leaves, or the grunting of a hog in the dark. But were the imaginations of children not crazed with wild ſtories concerning ſpirits and hobgoblins, darkneſs would be no more alarming to them than light. After informing the child of the exiſtence of a Deity, and teaching him to pray to him; next labour to impreſs his mind with a veneration for truth, and habituate him to a ſtrict adherence to it on every occaſion. Endeavour alſo to render him gentle and good-natured.

The beſt means you can uſe to teach him wiſdom or prudence in conducting himſelf in the ordinary buſineſs and intercourſe of life, is to teach him to deſpiſe the mean ſhifts of cunning. The reſt muſt be learned by actual experience in life.

The decencies of life, comprehended under the word Good Breeding, form no inconſiderable part of a good education. In teaching theſe, two things are to be attended to: Inſpire the youth with a diſpoſition to pleaſe and oblige all with whom he is converſant; next, teach him how to expreſs that diſpoſition in a becoming manner. Let boiſterous roughneſs, haughty contempt of others, cenſoriouſneſs, impertinent raillery, and a ſpirit of contradiction, be baniſhed from his temper and behaviour. At the ſame time, beware of leading him to regard the mere forms of intercourſe as a matter of the higheſt importance. Remember that genuine good-breeding is only an eaſy and graceful way of expreſſing good ſenſe and benevolence in his converſation and deportment.

Mr Locke, when he comes to give his opinion concerning thoſe parts of learning which are proper to be taught a young gentleman, and the manner in which they ought to be communicated, adviſes to initiate the child in the art of reading, without letting him know that he is engaged about a matter of any importance, or learning an accompliſhment which you are ſolicitous that he ſhould acquire. Preſent it to him in the form of an amuſement, or teach him to conſider it as an high honour to be permitted to learn his alphabet; otherwiſe he will turn from it with diſguſt. When by inſinuating arts you have allured him to apply to reading, put into his hands ſuch books as are plain, entertaining, and inſtructive. Inſiſt not on his reading over the bible: inſtead of gaining any advantage from an indiſcriminate peruſal of it at this period of life, he is likely to acquire the moſt confuſed notions of religion, and an indifference for the ſacred volume during the reſt of life; yet it may be highly proper to cauſe him to peruſe ſome of its beautiful hiſtorical paſſages, and to familiarize him with its elegant and ſimple moral precepts. After learning to read his mother-tongue, the boy's attention ought to be next directed to the art of writing. The eaſieſt way to teach him that art, is to get a plate engraved, after the model of any hand which you think moſt proper for his imitation. With this plate get a number of copies caſt with red ink; the letters of theſe the learner may trace with his pen filled with black ink: and he will thus in a ſhort time, and without much trouble to you or himſelf, acquire a decent hand. As drawing is uſeful on many occaſions in life; if the boy be not naturally incapable of acquiring it, he may with great propriety dedicate ſome part of his time and attention to that art.

When the ſcholar has attained a tolerable degree of ſkill in writing, and in reading and ſpeaking his native language, he muſt next begin an acquaintance with other languages. Among theſe, the firſt object of his ſtudy will naturally be the Latin. Yet let none waſte their time in attempting to acquire a knowledge of Latin, but ſuch as are deſigned for ſome of the learned profeſſions, or for the life of a gentleman without a profeſſion. To theſe laſt it may be uſeful; to others it is wholly unſerviceable. But in learning the Latin tongue, a much happier method than burdening and perplexing him with rules of grammar, would be to make him ſpeak it with a tutor who were ſufficiently maſter of it for that purpoſe. Thus might he ſpend that time which is uſually occupied in acquiring this language, in learning ſome other neceſſary branches of education. But if you cannot conveniently have the boy taught the language by the way of converſation, let the introductory books be accompanied with an Engliſh verſion, which he may have eaſy recourſe to for the explanation of the Latin. Never perplex him with grammatical difficulties. Reflect that, at his age, it is impoſſible to enter into the ſpirit of thoſe things. Render every thing as eaſy and pleaſing as poſſible; for the attention will not fail to wander, even though you labour not to render the taſk diſagreeable. Skill in grammar may be uſeful; but it is to thoſe whoſe lives are to be dedicated to the ſtudy of the dead languages: that knowledge which the gentleman and the man of the world may have occaſion to derive from the treaſures contained in the ancient languages, may be acquired without a painful ſtudy of proſody or ſyntax. As the learning of any language is merely learning words; if poſſible, let it be accompanied with the acquiſition of ſome real knowledge of things; ſuch as the nature of plants, animals, &c. their growth and propagation. But if you cannot or will not give your boy a private education, and are ſtill reſolved to ſend him to ſchool, to be whipped through the uſual courſe of Greek and Latin; at leaſt act with ſo much good ſenſe and humanity, as to inſiſt that he be not burdened and tormented with the compoſition of Latin themes and verſes. Neither let his memory be oppreſſed with whole pages and chapters from the claſſics. Such ridiculous exerciſes have no tendency, whatever prejudice may urge to the contrary, to improve him either in the knowledge of languages or of nature.

Mr Locke ſeems to wiſh that the French language, which in his days had attained to higher refinement and a more regular analogy than any of the other modern languages of Europe;—he ſeems to wiſh that the French were learned along with the Latin: and he wiſhes the ſtudy of theſe languages to be accompanied with the ſtudy of arithmetic, geography, hiſtory, and chronology. Let theſe branches of knowledge be communicated to the learner in one of the two languages; and he will thus acquire the language with greater facility. He next points out the advantages of the branches of knowledge which he recommends as proper to be learned together with the languages; but on that head he ſays nothing ſingular. One method which he recommends for facilitating the ſtudy of language is, to put into the youth's hands, as ſoon as he has acquired a tolerable knowledge of chronology, ſome of the moſt entertaining Latin hiſtorians: the intereſting nature of the events which they relate will not fail to command his attention, in ſpite of the difficulty which he muſt find in making out their meaning. The Bible and Tully's Offices will be his beſt guides in the ſtudy of ethics. The law of nature and nations, as well as the civil and political inſtitutions of his country, will form to him an important object, which he ought to ſtudy with the moſt careful attention. Rhetoric and logic, though generally regarded as objects of great importance in a liberal education, can neither of them contribute much, with all their rules and terms, to render him an acute reaſoner or an eloquent ſpeaker; and it is therefore unneceſſary for him to honour them with very particular attention. Tully and Chillingworth will be more beneficial in teaching him to reaſon and to perſuade, than all the treatiſes on rhetoric and logic which he can poſſibly peruſe, or all the lectures on thoſe arts which he can gain opportunities to hear. In every art and every ſcience, practice and experience are infinitely better than rules. Natural philoſophy, as contributing to inſpire the breaſt with warmer ſentiments of devotion, and ſerving alſo to many uſeful purpoſes in life, ought to make a part in the young gentleman's ſtudies. But the humble experimental writers on that ſubject are to be put into his hands in preference to the lofty builders of ſyſtems. As for Greek, our pupil is not to be a profeſſed ſcholar, but a gentleman and a man of the world; and therefore it does not appear neceſſary that Greek ſhould make a part in the ſyſtem of his education. But in none of theſe ſtudies will the pupil ever attain any proficiency, unleſs he be accuſtomed to method and regularity in the proſecution of them. In languages, let him gradually aſcend from what is ſimpleſt to what is moſt difficult: in hiſtory, let him follow the order of time; in philoſophy, that of nature.

Dancing, as contributing to eaſe and gracefulneſs of carriage, ought to make a part in our young gentleman's education. Fencing and riding being faſhionable, cannot well be denied him. As he is likely, in the courſe of life, to have ſome leiſure hours on his hands, and to be ſometimes diſpoſed to active recreation, let him learn ſome mechanical trade, with the exerciſe of which he may agreeably fill up ſome of thoſe hours. If he is to poſſeſs any property, let him not be unſkilled in the management of accounts. Travel, inſtead of being uſeful, appears more likely to be hurtful to the underſtanding and morals of the traveller, unleſs deferred to a later period than that at which young men are uſually ſent out to complete their education by traverſing through foreign countries.

Here Mr Locke concludes his work with obſerving, that he does not offer it to the world as a full or comprehenſive treatiſe on the ſubject of education; but merely as the outlines of what occurred to him as moſt proper to be obſerved in breeding up a young gentleman not intended for any learned profeſſion or mechanical employment, but for acting a reſpectable part in life at the head of a competent hereditary fortune.

23
Remarks.

In conſidering the ſentiments of this reſpectable philoſopher on the ſubject of education, we perceive, that as he was, on the one hand, ſuperior to thoſe prejudices which render us incapable of diſtinguiſhing the defects or abſurdities of any cuſtom or inſtitution which has long prevailed; ſo, on the other hand, he was free from that ſilly vanity which diſpoſes thoſe who are ſubject to its influence to affect novelty and ſingularity of ſentiment on every ſubject which they conſider. Though a member of one of the univerſities, he heſitates not to declare himſelf againſt a very laborious attention to claſſical learning; and his reaſoning is, through the whole of his treatiſe, rather plain and ſolid than ſubtle or refined.

Yet, however we reſpect the ſoundneſs of his underſtanding or the benevolence of his intentions, we cannot avoid obſerving, that his opinions are not always ſuch as experience juſtifies. He had no doubt taken notice of ſome inſtances in which the too great anxiety of parents about the preſervation of their children's health was the very means of rendering their conſtitution feeble and tender through the courſe of life; and from that circumſtance might be led to propoſe thoſe expedients which he mentions for preſerving the health and ſtrengthening the conſtitution of children. But a little more obſervation or inquiry would have eaſily convinced him, that ſome of his expedients, inſtead of ſtrengthening the child's conſtitution, would in all probability ſhorten his days.

He had perhaps ſeen ſome of the heroes of claſſical literature, who were familiar with Demoſthenes and Cicero, and had Homer and Virgil at their fingers ends,—he had ſeen ſome of thoſe gentlemen ſo overloaded with their cargo of Greek and Latin as to be unfit for the ordinary buſineſs and intercourſe of life; and ſuch inſtances might tempt him to forget the advantages which he himſelf, and a long ſeries of philoſophers, patriots, and ſtateſmen, with whoſe names the annals of our country are adorned, had derived from a regular claſſical education. But as we are afterwards to deliver our own ſentiments on this ſubject, we will not here extend our obſervations on Mr Locke to a greater length.

24
Rouſſeau.

An author more diſtinguiſhed than Mr Locke, for tenderneſs of ſentiment, ſingularity, eloquence, and whim, has preſented the public with a work on the ſubject of education, in which he, with unexampled boldneſs, inveighs againſt all the eſtabliſhed modes, as well as reprobates whatever had been advanced by former writers on the ſubject; and, at the ſame time, delineates a plan of education which he would perſuade us is infinitely ſuperior to thoſe which he explodes. This writer is the amiable and pathetic Rouſſeau: And tho' he be often vain, paradoxical, and whimſical; yet the charm of genius and ſentiment which adorns his writings will at leaſt engage our attention while he unfolds his opinions.

25
Imprudent management of children in infancy.

He ſets out with obſerving, that our buſineſs in the bringing up of children ſhould be, to ſecond and to call forth nature; and that, inſtead of this, we almoſt always oppoſe her intentions and operations. As ſoon as the child ſees the light, he is wrapped in ſwathing bands. His limbs are thus reſtrained from that free motion which is neceſſary to their growth and vigour; and even the internal parts of his frame are rendered incapable of their proper functions. Mothers are too proud or indolent, or too fond of gaiety and diſſipation, to ſubmit to the taſk of nurſing their own children. The poor infants are committed to ſome hireling nurſe, who not being attached to them by natural affection, treats them with negligence or inhumanity. But is that mother capable of any delicacy of ſentiment, who can permit another to ſuckle her child, and to ſhare with her, or perhaps wholly ſupplant her, in the filial affection of that child?

Again, when parents undertake the care of their infant children, they often injure them by miſtaken tenderneſs. They pamper them with delicate meats, cover them with warm clothes, and anxiouſly keep them at a diſtance from all that has the appearance of danger: not attending to the economy of nature, who ſubjects us in infancy to a long train of epidemical diſtempers, and expoſes us during the ſame period to innumerable dangers; the deſign of which doubtleſs is, to teach us a prudent concern for our own ſafety, and to ſtrengthen and confirm our conſtitutions.

A child no ſooner enters into life, than it begins to cry; and during a great part of infancy continues frequently to ſhed tears. We either attempt to ſoothe it into good nature, or ſeek to ſilence it by harſher means; and it is thus we infuſe into its infant mind thoſe evil paſſions which we afterwards preſume to impute to nature.

As the mother generally diſdains to nurſe her own child, ſo the father is ſeldom at leiſure to take any ſhare in the management of his education: he is put into the hands of a tutor. But that tutor whoſe time and attention can be purchaſed for money is unworthy of the charge. Either be yourſelf your ſon's preceptor, or gain a friend whoſe friendſhip to you ſhall be his ſole motive to undertake the taſk.

26
Management of Emilius's infancy.

After a few preliminary obſervations to the above purport, our author introduces his Emilius; in whoſe education he delineates that plan which he prefers. The preceptor whom he would aſſign Emilius muſt be young; and muſt dedicate his attention to Emilius alone, from the time when his pupil enters the world till he attain the full age of manhood. Emilius, to receive the full benefit of his preceptor's ſyſtem of education, and to afford full ſcope to it, muſt poſſeſs a genius of the middle claſs; no prodigy of parts, nor ſingularly dull; he muſt have been born to affluent circumſtances and an elevated rank in life. His preceptor is inveſted with the rights, and takes upon him the obligations, of both father and mother. Emilius is, when put ceptor is to provide him with a nurſe, who, as he is new born, muſt be newly delivered: it is of ſtill higher importance that ſhe be clean, healthy, virtuous, and of mild diſpoſitions. While ſuckling her charge, ſhe ſhall feed plentifully, chiefly on a vegetable diet. The child muſt be frequently bathed, in cold water if poſſible; if you begin with warm, however, uſe it by degrees colder and colder, till at length he is able to bear it entirely cold. He is not to be wrapped in ſwaddling-clothes or rollers, or bound with ſtay-bands; but put in good warm blankets and in a roomy cradle: Let him ſtretch and move his limbs at freedom, and crawl about on hands and knees at his pleaſure. The greateſt care muſt now be taken to prevent the child from contracting any habits whatever: Suffer him not to uſe one arm more than another, or to eat or ſleep at ſtated hours. Prepare him for the enjoyment of liberty, by preſerving to him the exerciſe of his natural abilities, unfettered by any artificial habits.

As ſoon as the child begins to diſtinguiſh objects, let his education begin. Some objects are naturally agreeable, others frightful. Accuſtom him to look upon any object that may come in his way without being affrighted. Children are at firſt ignorant of local relations, and learn to diſtinguiſh them only by experience; and while Emilius is yet an infant, incapable of ſpeaking or walking, he may be aſſiſted in acquiring the knowledge of theſe.

In his feeble helpleſs condition, the child muſt feel many wants and much uneaſineſs; tears are the language which nature has given him to make known his diſtreſſes and wants. When the child cries, it would be much more prudent and humane to examine what he ſuffers or ſtands in need of, than, as is uſually done, to rock or ſing him aſleep; or, when theſe means ſucceed not, to threaten or uſe him brutally.

In managing children, as nature has endowed them with no ſuperfluous powers, we ought not to confine them from the free uſe of thoſe which they are able to exert. It is our duty to ſupply their deficiency both of mental and bodily powers; but while we are ready to adminiſter on every occaſion to their real wants, we muſt beware of gratifying their caprice or unreaſonable humours. In order to diſtinguiſh between their natural and fantaſtic wants, we muſt ſtudy the language and ſigns by which they expreſs their wiſhes and emotions. Though crying be the means which nature has given infants to enable them to procure relief or aſſiſtance, yet when they cry they are not always in need of either. They often cry from obſtinacy or habits of peeviſhneſs. But if, inſtead of attempting to ſoothe them by diverting their attention to other objects, we would on ſuch occaſions entirely neglect them, they would ſoon ceaſe to indulge in ſuch fits of crying.

When children begin to ſpeak, we are uſually anxious about their language and articulation, and are every moment correcting their blunders. But inſtead of hoping to teach them purity or correctneſs of ſpeech by ſuch means as theſe, let us be careful to ſpeak eaſily and correctly before them, and allow them to expreſs themſelves in the beſt manner they can. By ſuch means we will be much more likely to obtain our wiſhes ſity of uſing an open diſtinct articulation.

When the child attains the power of expreſſing himſelf in artificial language, he may then be conſidered as having reached the ſecond period of infancy. He needs not now to make known his wants by tears, and ſhould therefore be diſcouraged from the uſe of them. Let his tears be entirely neglected. He now begins to run about, and you are anxious to prevent him from hurting himſelf; but your anxiety can only render him peeviſh or timid. Remove him from any very alarming danger, and then ſuffer him to run about at his pleaſure. He will now and then bleed, and hurt himſelf; but he will become bold, lively, and cheerful.

27 Subjection to authority.

In regulating the conduct of your child, let him know that he is dependant; but require not of him an implicit ſubmiſſion to your will. Let his unreaſonable deſires be oppoſed only by his natural inability to gratify them, or by the inconveniences attending the gratification. When he aſks what is neceſſary or reaſonable, let him inſtantly obtain it; when he aſks what is unreaſonable or improper, lend a deaf ear to all his intreaties and demands. Beware of teaching him to eſtabliſh his authority over you by means of the forms of politeneſs. A child will ſcarce take the trouble to addreſs you with *If you pleaſe*, unleſs he has been made to regard theſe as a ſet of magic ſyllables, by the uſe of which he may ſubject every perſon to his will. His *If you pleaſe* then means *I pleaſe; pray*, with him, ſtands for *do*. Though you put in his mouth the words of humility, his tone and air are thoſe of authority that *will* be obeyed.

Sacrifice not the preſent happineſs of your child for the ſake of any diſtant advantage.

Be not too anxious to guard him againſt natural evil. The liberty which he enjoys while he is now and then permitted to expoſe himſelf to blows, or cold, or wetneſs, is more than a ſufficient compenſation for all that he thus ſuffers.

28 Ideas of moral obligation.

Seek not to impreſs him with ideas of *duty* or *obligation*. Till children reach the years of diſcretion, they are incapaple of any notions of the diſtinctions of morality. Avoid therefore even the uſe of the terms by which theſe are expreſſed in their hearing. While they continue to be affected only by ſenſible objects, ſeek not to extend their ideas beyond the ſphere of ſenſation. Try all the powers of language, uſe the plaineſt and moſt familiar methods you can contrive; you ſhall ſtill be unable to give the boy at this age any juſt ideas of the diſtinction between right and wrong. He may readily conceive, that for one ſet of actions you will puniſh him, and that by another he will obtain your approbation; but farther than this his ideas of *right* and *wrong*, of *virtue* and *vice*, cannot yet be carried.

The powers of the human mind are gradually unfolded. At firſt, the infant is capable only of perception; by and by, his inſtincts and paſſions begin to exert their force; at length, as he advances towards manhood, reaſon begins to act, and he becomes able to feel the beauty of virtue and the deformity of vice.

But though you [illegible] not to regulate his conduct by notions of *duty*, yet let him feel the yoke of neceſſity. Let him know, that as he is weaker than you, he muſt not, therefore, expect that you ſhould be ſubject to his will; and that, as he has neither ſkill nor ſtrength to control the laws of nature, and make every object around him bend to his pleaſure, he cannot hope to obtain the gratification of all his wiſhes. Thus you teach him virtue before he knows what virtue is; and call forth his reaſon without miſleading or perverting it. Let him feel his impotence; but forbid him not to think, that if he had power there would be no reaſon why he might not at pleaſure even turn the world upſide down.

Hitherto you have given your pupil no verbal inſtructions, nor muſt you yet attempt to inſtruct him by any other means than experience; let all his knowledge be literally of his own acquiſition.

Let not the parent who has obſerved the conduct of children brought up in the uſual way be afraid that, if his child ſhould be treated like our pupil, he would become ſtupid and vicious. Nature ſends not human beings into the world with a prediſpoſition to vice: we ſow the ſeeds of it in the infant heart; and by our abſurd modes of treatment, we alſo enfeeble and pervert the powers of the underſtanding.

But from the hour of his birth till he attain the age of twelve, the education of Emilius ſhall be purely negative. Could we but bring him up healthy and robuſt, and entirely ignorant, till that period, the eyes of his underſtanding would then be open to every leſſon: free from the influence of habit and prejudice, his paſſions would not then oppoſe us; and we might render him the wiſeſt and moſt virtuous of men. If we can but loſe time, if we can but advance without receiving any impreſſions whatever, our gains are unſpeakable. Nature gives the powers of every mind ſome particular direction: but that particular bias, impreſſed by the hand of nature, cannot be diſtinguiſhed before the period we have mentioned; and if you counteract nature, inſtead of ſeconding her views, the conſequences cannot but be highly unfavourable both to the heart and the underſtanding of your pupil.

Perhaps, in the midſt of ſociety, it may be difficult to bring up our pupil without giving him ſome idea of the relations between man and man, and of the morality of human actions. Let that, however, be deferred as long as poſſible.

Were Emilius to witneſs a ſcene of anger, and to aſk the cauſe of the appearances which he beheld, he ſhould be told that the perſons were affected with a fit of ſudden illneſs. We might thus perhaps prevent the unhappy effects of ſuch an example.

The firſt moral notions which ſhould be communicated to the child are thoſe of property. To communicate the ideas of property to our pupil, we will direct him to take poſſeſſion of ſomething; for inſtance, of a piece of ground belonging to ſome other perſon, and in a ſtate of cultivation. Let him cultivate this ſpot of ground anew, ſow it with ſeeds, and look eagerly forward to the time of harveſt in the hopes of reaping the fruit of his labours. In the mean time, let the proprietor of the ground take notice of what is done, deſtroy your pupil's riſing crop, and complain of the injuſtice done him. While the boy laments his loſs and the diſappointment of his hopes, in all the bitterneſs of grief, let the proprietor of the ground ſtill inſiſt on the injury done him, and complain of what he ſuffers by the purpoſe for which he himſelf had cultivated and ſown the ground being fruſtrated. Our pupil, now ſenſible of the reaſonableneſs of the other's claims, will deſiſt from his lamentations, and only beg to have ſome other ſpot aſſigned him which he may cultivate at his pleaſure without offending any perſon. This he will juſtly conſider as his own property, to the productions of which raiſed by his own labour he has an excluſive right, and in the occupying of which none ought to moleſt him. In ſome ſuch manner as this may the nature of property, the idea of which eaſily refers in this inſtance to the firſt occupier, and afterwards the exchange of property, be explained to him.

Another inſtance of the manner in which the pupil is now to be managed may not be improper in this place. He is poſſibly ſo rude and boiſterous as to ſpoil or break whatever is within his reach. Be not angry with him, however, if he break the utenſils which he has conſtant need of; be in no haſte to ſupply him with others in their room; let other things be removed out of his way: if he break the windows of his apartment, let him be expoſed night and day to the cold; complain not of the inconvenience yourſelf, but order matters ſo that he may feel it. After ſome time, let them be mended up; and if he break them again, change your method. Tell him calmly, "Theſe windows are mine; I took care to have them put there; and I will prevent their being again broken, by confining you in a dark room." Let all his endeavours to avoid this prove ineffectual. Let him be actually confined, and be liberated only on propoſing and agreeing to the condition of breaking no more windows. When he propoſes this condition, be ready to liſten to him; obſerve that it is well thought on, and that it is a pity he did not think of it ſooner. Conſider this engagement between you as ſacred; treat him as before, and you cannot fail to attain the end in view.

The moral world now opens to us: But no ſooner are we able to diſtinguiſh between right and wrong, than we become deſirous to conceal thoſe inſtances in which we act wrong. Lying is therefore a vice of which your pupil is now apt to be guilty: you cannot always prevent, but you can puniſh; but let the puniſhments which you inflict appear to the child only the natural conſequences of his conduct. If he is in any inſtance convicted of a lie, let his aſſertions no longer gain credit. By this means, ſooner than by precepts, or any other ſpecies of puniſhment, will you be able to reclaim him from the habit of lying.

The methods generally taken to render children virtuous are prepoſterous and fooliſh. To render them generous and charitable, we give them money, and bid them beſtow it in alms, while we ourſelves give nothing; but the parent or maſter, and not the child, ſhould beſtow the alms. Example might produce the wiſhed-for effect. Beſides, children are ſtrangers to the value of money. A gingerbread cake is more to them than an hundred guineas. Though you teach them to give away money, till you perſuade them to part readily with thoſe things which they value moſt, you do not inſpire them with generoſity. Would you make them liberal by at this period, hope to teach your pupil any of the virtues.

The only leſſon of morality that can with any propriety be inculcated on children, is to injure no perſon. Even the poſitive precept of doing good, muſt be conſidered as ſubordinate to this negative one of doing no harm. The moſt virtuous and the moſt exalted of characters, is the man who does the leaſt harm to his fellow-creatures.

In a public education, it will be neceſſary to attempt the communication of moral inſtruction at an earlier period than in a private one. In a private education, it will always be beſt to allow the moral powers of children to ripen as much as poſſible before you endeavour to inform and direct them by precepts.

There is an inequality among geniuſes; and fond mothers and fathers may be diſpoſed to plead for exceptions in favour of ſuch of their children as they view with a partial eye. "This boy's mind is more capacious, his powers are riper, than thoſe of others." But however great the ſeeming diſparity of geniuſes may be, it is at bottom but inconſiderable. Let the age of children be therefore regarded as a common meaſure by which their treatment is to be regulated.

However quick and tenacious the memories of children may ſeem, they can derive little advantage from the exertions of memory till ſuch time as judgment begins to act. All the knowledge that they acquire in the courſe of the uſual ſyſtem of education, is merely the knowledge of words. The languages, geography, chronology, in ſhort all that they are taught, and called to diſplay ſo oſtentatiouſly at this period of life, ſerve no other purpoſe than to fill their minds with words.

29 Hiſtory, how far proper to be put into the hands of boys.

Hiſtory is eſteemed a proper thing to be put into the hands of children. But except you wiſh to confine their attention to the external and phyſical actions, it is almoſt nothing they can acquire by the peruſal of it. And if diveſted of the moral diſtinctions of actions, of the workings of the paſſions, and the complication of intereſts, what is there to render hiſtory entertaining? We may indeed eaſily teach them to repeat the words *kings, emperors, wars, conqueſts, revolutions, laws*: but of the things which you uſe theſe words to denote, you will find they are hitherto incapable of forming any clear ideas.

But the mere knowledge of words is not ſcience; make your pupil acquainted with things, and he will not fail to acquire their names. Emilius muſt never be ſet to get any compoſition by heart, not even fables: be careful to place before him thoſe ſcenes and objects, the images of which it may be uſeful for him to have impreſſed on his memory; but by no other means ſeek to aſſiſt him to improve that faculty.

Emilius ſhall not even learn to read till he attain the age of twelve: for, before that period, it can be of no benefit to him; and the labour would only make him unhappy during that period of life which is naturally the golden part of our days. But when he has attained the proper age, matters ſhall be ſo ordered, that he ſhall find his ignorance of letters an inconvenience. A card ſhall be ſent him, which being unable when it is now too late to take advantage of ſome agreeable invitation which it contained. This may be two or three times repeated. At length he becomes eager to learn to read; and accompliſhes that almoſt without aſſiſtance.

The principle on which we proceed, is to leave the pupil almoſt wholly under his own direction, ſeemingly at leaſt; to lead him to acquire new accompliſhments, ſolely from the deſire of increaſing his powers, and extending his influence; and humbly to follow nature, not to force her.

As we are deſirous of cultivating his underſtanding, the means which we employ for that purpoſe is, to cultivate thoſe abilities on which it depends; he is always active and in motion. Let us firſt make him a man in point of health and vigour, and he will ſoon become a man in underſtanding.

By our conſtant attention to the welfare of children, we render it unneceſſary for them to attend to it themſelves. What occaſion has your ſon or pupil to obſerve whether the aſpect of the ſky threaten rain, when he knows that you will take care to have him ſheltered from a ſhower? or to regulate the length of his excurſions, when he is ſure that you will not ſuffer him to loſe his dinner?

While matters are ſo ordered that Emilius thinks himſelf ſubject only to his own will, though all his motions are regulated according to your pleaſure; inſtead of becoming fantaſtic and capricious, he inſenſibly acquires the habit of keeping utility in view in all his actions.

The firſt objects which engage the attention of children are the appearances of the material world around them: our firſt ſtudy is a kind of experimental philoſophy; our inſtruments and inſtructors are our hands, our feet, and our eyes. By exerciſing theſe bodily organs, the boy will acquire more real knowledge even in the period of childhood, than if we ſhould dedicate nine-tenths of his time to books, from the age of ſix to ſixty. All who have examined, with any ſagacity, the characters, circumſtances, and manners of the ancients, have agreed in attributing to their gymnaſtic exerciſes that ſuperior ſtrength of body and mind which renders them objects of admiration to the moderns.

Our pupil's clothes cannot be too light and eaſy. If tight and cloſe, they fetter and confine his joints and limbs, and likewiſe obſtruct the circulation of the blood; if accuſtomed to warm clothing, he will ſoon become incapable of bearing cold.

30 Expoſure and exerciſe.

In every thing let him be habituated to what is plain and hardy. Let his bed be coarſe and hard, his clothes plain, his fare ſimple. Infants muſt be freely indulged in ſleep: but as Emilius is now advanced beyond infancy, he muſt be accuſtomed at times to go to bed late and get up early, to be ſometimes haſtily waked from ſleep; and thus to prepare himſelf for what he may afterwards have occaſion to ſubmit to in the courſe of life.

As this period is in [illegible] particular manner that of exerciſe, and Emilius [illegible] encouraged to take as much exerciſe as he chooſe [illegible] we muſt endeavour to prompt [illegible] but without ſeeming to direct him to ſuch as are moſt proper. Swimming, though not generally attended to, is yet one of the firſt which a boy ought to learn. It may, in many occaſions in life, be of the greateſt advantage, by enabling us to ſave our own life or the life of others. Emilius ſhall be taught to ſwim; he ſhall be taught whatever can really enlarge the ſphere of his power: "could I teach him to fly in the air, I would make him an eagle; if to bear the fire, a ſalamander."

To exerciſe the ſenſes is not merely to make uſe of them; it is to learn to judge by them. Call not your pupil to exert all his ſtrength on every occaſion; but let him learn to judge of the truth of the information which he receives from one ſenſe, by having recourſe to the evidence of another.

It is not impoſſible to improve the ſenſes to an higher degree of perfection than that which they uſually attain. Blind men generally poſſeſs the ſenſe of touch in a more exquiſite degree, than we who have alſo eyes to guide and inform us. But they acquire this ſuperior delicacy and acuteneſs of ſenſation, only by their finding it neceſſary to have more frequent recourſe to the information of that ſenſe. Here is then a wide field for improvement and agreeable exerciſe to our pupil.

31
Darkneſs and ghoſts.

What a variety of uſeful diverſions might he be led to entertain himſelf with in the courſe of the night. The hours of darkneſs are generally hours of terror, not only to men, but alſo to the brute animals. Even reaſon, knowledge, and courage, are not always ſufficient to render us ſuperior to the terror which darkneſs inſpires.

This timidity is uſually attributed to the tales of ghoſts and goblins with which we are frightened in infancy. But it originates from another cauſe; our ignorance of what is paſſing around us, and our inability to diſtinguiſh objects during that period of darkneſs. The paſſion of fear was implanted by nature in the human breaſt, in order that it might ſerve to put us on our guard againſt danger. But in conſequence of our being ſubject to the influence of that paſſion, when we are ignorant of what ſurrounds us, imagination calls up dangers on all hands. And ſuch is the cauſe from which our terror in darkneſs naturally ariſes.

But the only way to free our pupil from this tyranny of imagination, is to oppoſe to it the power of habit. A bricklayer or tyler is never giddy on looking down from the roofs of houſes. Neither will our pupil be alarmed by the terrors of darkneſs, if he be accuſtomed to go frequently abroad under night. It is eaſy to contrive a number of little amuſements, the agreeableneſs of which may, for a time, overcome our pupil's averſion for darkneſs; and thus may a habit be at length impreſſed.

Let us give yet another inſtance of the means by which children may be led to do what we wiſh, without our impoſing any reſtraint on their will. Suppoſe Emilius is lazy and inactive, and we wiſh to make him learn to run. When walking out with the young ſluggard after dinner, I would ſometimes put a couple of his favourite cakes in my pocket; of theſe each of us ſhould eat one in the courſe of our walk. After ſome time I would ſhow him I had put a third cake in my pocket. This he would not fail to aſk after finiſhing his own: no, ſays I, I can eat it myſelf, or we will divid it;—or ſtay, we had better let theſe two little boys there run a race for it. Accordingly I propoſe the race to the boys; who readily accept the conditions, and one of them carries off the prize. After ſeeing this ſeveral times repeated, Emilius begins to think himſelf qualified to obtain the third cake as well as any of the little boys, and to look upon running as an accompliſhment of ſome conſequence. He ſeeks an opportunity of being permitted to enter the liſts. He runs; and after being two or three times outſtripped, is at length ſucceſsful, and in a ſhort time attains an undoubted ſuperiority.

32
Drawing.

As children naturally imitate almoſt whatever they behold, they are often diſpoſed to attempt drawing. In this our pupil might be indulged, not merely for the ſake of the art, but to give him a ſteady hand and a good eye. But he ſhould draw from nature, not from other drawings or from prints. Were he to draw the likeneſs of a horſe, he ſhould look at the animal; if to attempt a repreſentation of a houſe, he ſhould view the houſe itſelf. In this method he will, no doubt, ſcratch for a long time without producing any likeneſs: but he will acquire what we propoſed as the ends of his attempting to draw; namely, ſteadineſs of hand and juſtneſs of ſight, by this method, ſooner than by any others.

33
Geometry.

Geometry, when taught in the uſual way, is certainly above the capacity of children; they cannot go along with us in our reaſonings: Yet they are not totally incapable of acquiring even this difficult ſcience; if, when they are proſecuting their amuſements, you lead them inſenſibly to obſerve the properties of the circle, the triangle, and the ſquare, and place them now and then in circumſtances when they may have occaſion to apply their knowledge of theſe to real uſes in life.

A child has been taught the various relations between the outlines, ſurfaces, and contents of bodies, by having cakes ſet before him, cut into all manner of regular ſolids; by which means he was led to maſter the whole ſcience of Archimedes, by ſtudying which form contained the greateſt quantity.

There is a period between infancy and the age of puberty at which the growth and improvement of our faculties exceed the increaſe of our deſires. About 12 or 13, when the appetite for the ſex has not yet begun to make itſelf felt, when unnatural wants are yet unknown, no falſe appetites yet acquired; at that period, though weak as a man, as a child the youth is ſtrong.

This interval, when the individual is able to effect more than is neceſſary for the gratification of his wiſhes, contains the moſt precious moments of his life, which ought to be anxiouſly filled up in an uſeful manner. This is the beſt time for employment, for inſtruction, for ſtudy.

Now, let us begin to conſider what is uſeful; for, hitherto, we have only inquired what was neceſſary. In entering on our ſtudies, we will make no account of any but ſuch as inſtinct directs us to purſue: thoſe which the pedants and the pretended philoſopher are ing the admiration of mankind, are unworthy of our notice.

The earth which we inhabit, and the ſun by whoſe beams we are enlightened, are the firſt objects which claim our attention. We will therefore direct the attention of our pupil to the phenomena of nature. We will lead him to the knowledge of geography, not by maps, ſpheres, and globes: we will lead Emilius out on ſome beautiful evening to behold the ſetting ſun. Here we take particular notice of ſuch objects as mark the place of his going down. Next morning we viſit the ſpot to contemplate the riſing of the glorious luminary. After contemplating for ſome time the ſucceſſive appearances which the ſcene before us aſſumes, and making Emilius obſerve the hills and the other ſurrounding objects, I ſtand ſilent a few moments, affecting to be occupied in deep meditation: At laſt I addreſs him thus: "I am thinking, that, when the ſun ſet laſt night, it went down yonder; whereas this morning, you ſee he is riſen on the oppoſite of the plain here before us. What can be the meaning of this?" I ſay nothing more at this time, but rather endeavour to direct his attention to other objects.

This is our firſt leſſon in coſmography.

Our laſt obſervation was made about Midſummer; we will next view the riſing ſun on ſome fine morning in the middle of winter. This ſecond obſervation ſhall be made on the very ſame ſpot which we choſe for the former. When Emilius and I perceive the ſun now emerging above the horizon, we are ſtruck at the change of the place of his riſing.—By ſuch leſſons as theſe may the pupil be gradually taught a real, not a ſeeming, acquaintance with the relative motions of the ſun and the planets and with geography.

34
Objects during the ſecond period of childhood.

During the firſt period of childhood, the great object of our ſyſtem of education was to ſpend our time as idly as poſſible, in order that we might avoid employing it to an ill purpoſe: but our views are now changed with our pupil's progreſs in life; and we have ſcarce enough of time for the accompliſhment of our neceſſary purſuits. We therefore proceed as quickly as poſſible in making ourſelves acquainted with the nature of the bodies around us, and the laws by which their motions and appearances are regulated. We keep to this ſtudy at preſent, as being neceſſary for the moſt important purpoſes in life, and as being the moſt ſuitable to the preſent ſtate of our pupil's powers. We ſtill begin with the moſt common and obvious phenomena of nature, regarding them as mere facts; and, advancing from theſe, we come to generalize by degrees.

As ſoon as we are ſo far advanced as to be able to give our pupil an idea of what is meant by the word *uſeful*, we have attained a conſiderable influence over his future conduct. On every occaſion after this a frequent queſtion between us will be, Of what uſe is that? This ſhall be the inſtrument by means of which I ſhall now be able to render him abſolutely ſubmiſſive to my wiſhes. However, I will allow him to make uſe of it in his turn, and will be careful not to require of him to do or learn any thing the utility of which he cannot comprehend.

do not underſtand. Emilius ſhall have as little recourſe as poſſible to books for inſtruction. Yet if we can find a book in which all the natural wants of man are diſplayed in a manner ſuitable to the underſtanding of a child, and in which the means of ſatisfying those wants are gradually diſplayed with the ſame eaſe and ſimplicity; ſuch a book will be worthy of his moſt attentive ſtudy. There is ſuch a book to be found; but it is neither Ariſtotle, nor Pliny, nor Buffon; it is Robinſon Cruſoe. Emilius ſhall have the adventures of Robinſon put into his hands: he ſhall imitate his example; even affect his dreſs; and, like Robinſon, learn to provide for himſelf without the aid of others.

35
Robinſon Cruſoe.

Another employment of Emilius at this period ſhall be, to viſit the ſhops of various artiſans; and when he enters a ſhop, he ſhall never come out without lending a hand to the work, and underſtanding the nature and the reaſon of what he ſees going forward.

Still, however, we are careful to afford not a hint concerning thoſe ſocial relations the nature of which he is not yet able to comprehend.

The value and importance of the various arts are ordinarily eſtimated, not according to their real utility, but by a very injudicious mode of eſtimation: Thoſe which contribute in a particular manner to the gratification of the fantaſtic wiſhes of the rich, are preferred to thoſe which ſupply the indiſpenſable neceſſaries of life. But Emilius ſhall be taught to view them in a different light. Robinſon Cruſoe ſhall teach him to value the ſtock of a petty ironmonger above that of the moſt magnificent toy-ſhop in Europe. Let us eſtabliſh it as a maxim, that we are to lead our pupil to form juſt notions of things for himſelf, not to dictate to him ours. He will eſtimate the works both of nature and art by their relation to his own convenience; and will therefore regard them as more precious than gold—a ſhoemaker or a maſon, as a man of more importance than the moſt celebrated jeweller in Europe.

The intercourſe of the arts conſiſts in the reciprocal exchange of induſtry; that of commerce, in the exchange of commodities; and that of money, in the exchange of bills and caſh. To make our pupil comprehend the nature of theſe, we have now only to generalize and extend to a variety of examples thoſe ideas of the nature of property, and of the exchange of property, which we formerly communicated to him. The nature of money, as bearing only a conventional value, which it derives from the agreement of men to uſe it as a ſign for facilitating commerce, may be now explained to Emilius, and will be eaſily comprehended by him. But go no farther: ſeek not yet to explain to the child in what manner money has given riſe to the numerous chimeras of prejudice and caprice; nor how countries which abound moſt in gold and ſilver, come to be the moſt deſtitute of real wealth.

Still our views are directed to bring up our pupil in ſuch a manner that he may be qualified to occupy any place in the order of ſociety into which even the caprice of fortune can throw him. Let us make him a man; not a ſlave, [illegible] or a monarch. How much ſuperior the charac[illegible] a king of Syracuſe turned ſchoolmaſter at Corinth, of a king of Macedon become a notary at Rome, to an unhappy Tarquin incapable of ſupporting himſelf in a ſtate of independence when expelled from his kingdom!

36 The propriety of making a young man, in whatever ſphere of life, learn a trade.

Whatever be our ſituation in the world, we can contribute nothing but our perſonal abilities to ſociety. To exert them is therefore the indiſpenſable duty of every one who enjoys the advantages of a ſocial ſtate; and to cultivate them in our pupil to the beſt purpoſe, ought to be the great aim of every courſe of education. Emilius has already made himſelf familiar with all the labours of huſbandry; I can therefore bid him cultivate the land which he inherits from his father. But if it ſhould be loſt, what ſhall be his reſource? He ſhall learn a trade, that he may be provided againſt ſuch an accident. And he ſhall not be a politician, a painter, a muſician, or an architect; to gain employment for his talents in any of theſe arts, would coſt him no leſs trouble than to regain his loſt eſtate. He ſhall learn ſome ſimple mechanical art: he will then need only to ſtep into the firſt ſhop he ſees open, to perform his day's labour, and receive his wages.

It may be here proper to take notice of a miſtake into which people generally fall in determining the trade or profeſſion in which they are to place their children. Some accident diſpoſes the child to declare himſelf for a particular employment: the parent regards that as the employment to which his talents are fitted by the deſign of nature; and permits him to embrace it without inquiring whether another would have been more ſuitable or advantageous. But becauſe I am pleaſed with my occupation, I am not on that account neceſſarily qualified for it. Inclinations do not confer abilities. It requires more careful and accurate obſervation than is generally imagined, to diſtinguiſh the particular taſte and genius with which nature has endowed the mind of a child. We view him careleſsly, and of conſequence we are apt to miſtake caſual inclination for original diſpoſition.

But Emilius needs not now to heſitate about the occupation which he is to chooſe. It is to be ſome mechanical employment. All the diſtinction we have now to make is, to prefer one that is cleanly and not likely to be injurious to his health. We ſhall make choice of that of a joiner. We cannot dedicate all our time to the trade; but at leaſt for two days in the week we will employ ourſelves in learning our trade. We will have no workſhop erected for our convenience, nor will we have a joiner to wait on us in order to give us the neceſſary inſtructions: but for the two days in every week which we dedicate to the purpoſe of learning a trade, we will go to our maſter's workſhop; we will riſe before him in the morning; work according to his orders; eat at his table; and, after doing ourſelves the honour of ſupping with his family, return to our own hard mattreſſes at night. We ſhall be treated only according to the merit of our performances. Our maſter ſhall find fault with our work when clumſily or negligently done, and be pleaſed with it only when well executed.

37 New ideas ſuggeſted to Emilius by his application to a trade.

While my pupil has been accuſtomed to bodily exerciſe and manual labour, his education has been hitherto conducted in ſuch a manner as to give him inſenſibly a taſte for reflection and meditation. Before he has been long a workman, therefore, he will begin to become more ſenſible of that inequality of ranks which takes place in the order of ſociety. He will therefore take notice of his own dependence, and of my apparent wealth, and will be deſirous to know why I contribute not my perſonal exertions to ſociety. I put off the queſtion with telling him, that I beſtow my ſuperfluous wealth on him and the poor; and will take to make a bench or table every week, that I may not be quite uſeleſs to the public.

38 Progreſs that Emilius has made before the age of puberty.

And now when about to enter the moſt critical period of life, when juſt on the brink of that age at which the heart and blood begin to feel the impulſe of a new appetite, what progreſs has our pupil made? what knowledge has he acquired? All his ſcience is merely phyſical. Hitherto he has ſcarce acquired any ideas of moral relations; but the eſſential relations between men and things he has attentively ſtudied. He knows the general qualities of certain bodies; but upon thoſe qualities he has not attempted to reaſon. He has an idea of abſtract ſpace, by means of geometrical figures; of abſtract quantity, by means of algebraical ſigns. He has no deſire to find out the eſſence of things; their relations alone intereſt him. He values nothing external but from its relation to himſelf. The general conſent of mankind, or the caprice of cuſtom, have not yet given any thing a value in his eyes; utility alone is his meaſure of eſtimation. He is laborious, temperate, patient, reſolute, and bold. His imagination never exaggerates danger. He ſcarce knows as yet what death is; but ſhould it approach him, he is prepared to ſubmit to neceſſity. He is virtuous in every thing relative merely to himſelf. He is prepared to become a virtuous member of ſociety as ſoon as he ſhall be made acquainted with the nature of his ſocial relations. He is free from vice and error as far as is poſſible for human nature. He conſiders himſelf as unconnected with others; requires nothing from any perſon, and thinks none has a right to require any thing of him. Sure a youth arrived thus at his fifteenth year has not miſpent the period of his infancy.

39 New meaſures to be adopted in his education at that age.

But now our pupil has reached the moſt critical period of life. He now feels the influence of the paſſion for the ſex; and as ſoon as we become ſubject to the influence of that paſſion, we are no longer unſocial beings. The want of a miſtreſs ſoon produces the want of a friend.

As hitherto we have been careful not to force or anticipate nature, ſo even now our attention muſt be directed to divert the impulſes of that dangerous appetite which now begins to make itſelf felt. To confine the growing paſſions within proper limits, let it be our care to defer as long as poſſible the time at which they begin to diſplay themſelves. For this purpoſe, let us cautiouſly guard our words and actions in the preſence of our pupil. Let us be careful to give him no premature inſtructions.

To excite and cheriſh that ſenſibility of mind which now firſt begins to ſhow itſelf, to extend the care of the youth beyond himſelf, and to intereſt him in the welfare of his fellow creatures; let us be careful to put ſuch objects in his way as have a tendency to call forth and refine the feelings. It is not poſſible for the human heart to ſympathiſe with thoſe who are happier than ourſelves: our ſympathy is moved only by the ſight of miſery. We pity in others only thoſe diſtreſ-

ſes

tity of the evil, but by the ſuppoſed ſenſibility of the ſufferer. Let theſe obſervations ſerve to direct us in what manner we are to form the minds of children to humanity and compaſſion.

In proſecution of our deſign, to retard rather than accelerate the growth of the paſſions, let us, when that critical period which we have ſo much feared comes on, ſeclude him as much as poſſible from the intercourſe of ſociety, where ſo many objects appear to inflame the appetites. Let us be circumſpect in the choice of his companions, his employment, his pleaſures. Let all our care be directed to nouriſh his ſenſibility without inflaming his deſires. As his moral powers now begin to unfold themſelves; in cultivating them, let us proceed not by way of lecture, or by directing his attention to books, but ſtill by leading him to acquire experience. At length the period will arrive for communicating to him ſome religious inſtruction. When he knows the nature of his relations to ſociety, he may be informed of his relation to and dependence upon a Deity.

[The creed of the Savoyard curate, containing thoſe ſentiments concerning religious matters which Rouſſeau ſeems to propoſe as the moſt proper to be inculcated on his pupil, comes next in the order of the work; but it does not appear to be ſo cloſely connected with the ſubject of education as to render it proper for us to give a view of it in this place. The ſentiments which he there advances, the reaſonings which he urges, are evidently hoſtile to revealed religion; and the power of his eloquence has adorned ſlight and ſuperficial arguments with ſuch a charm, that even the ſterneſt believer, if not abſolutely deſtitute of taſte and feeling, muſt read them with delight.]

And now, notwithſtanding all my arts, I can no longer keep back that moment which I have endeavoured to defer to as late a period as poſſible. As ſoon as I perceive that it has certainly arrived, I no longer treat Emilius as my pupil or diſciple, but as my friend. His affections are now expanded beyond himſelf; his moral powers have begun to exert themſelves, and have received ſome cultivation; he alſo is become capable of religious ſentiments, and inſtructed in the nature of his relation to a ſupreme Being. Beſides, it is now requiſite, if we conſider the period to which nature has conducted him, that he ſhould no longer be treated as a ſimple child. Hitherto ignorance has been his guardian, but now he muſt be reſtrained by his own good ſenſe.

Now is the time for me to give him in my accounts; to ſhow him in what manner his time and mine have been employed; to acquaint him with his ſtation and mine, with our obligations to each other, his moral relations, the engagements he has entered into with regard to others, the degree of improvement which he has attained, the difficulties he will hereafter meet with, and the means by which he may ſurmount them:—in a word, to point out to him his critical ſituation, and the new perils which ſurround him; and to lay before him all the ſolid reaſons which ſhould engage him to watch with the utmoſt attention over his conduct, and to be cautious of indulging his youthful deſires.

40
Means employed to preſerve the purity of his manners.

are what he muſt carefully avoid at this age. He has learned a trade, he is not unſkilled in agriculture; theſe may be means, but not our only means, for preſerving him from the impulſe of ſenſual deſire. He is now too familiar with theſe: he can exerciſe them without taking the trouble to reflect; and while his hands are buſy, his head may be engaged about ſomething quite different from that in which he is employed. He muſt have ſome new exerciſe which may at once fix his attention and cauſe him to exert his bodily powers. We can find none more ſuitable for this purpoſe than hunting. Now, therefore, Emilius ſhall eagerly join in the chace; and though I do not wiſh him to acquire that cruelty of diſpoſition and ferocity of temper which uſually diſtinguiſh thoſe who dedicate their lives to that barbarous diverſion, yet at preſent it may have the happieſt effects in ſuſpending the influence of the moſt dangerous of paſſions.

When I have now conducted my pupil ſo far; have informed him of what I have done for him, and of the difficulty of his ſituation; and have reſigned my authority into his hands; he is ſo ſenſible of the dangers to which he is expoſed, and of the tender ſolicitude with which I have watched over him, that he ſtill wiſhes to continue under my direction. With ſome feigned difficulty I again reſume the reins. My authority is now eſtabliſhed. I may command obedience; but I endeavour to guard againſt the neceſſity of uſing it in this manner.

To preſerve him from indulging in licentious pleaſures, I let him know that nature has deſigned us for living in a ſtate of marriage, and invite him to go in ſearch of a female companion. I will deſcribe to him the woman whom he is to conſider as worthy of his attachment in the moſt flattering colours. I will array her in ſuch charms, that his heart ſhall be hers before he has once ſeen her. I will even name her: her name ſhall be Sophia. His attachment to this imaginary fair one will preſerve him from all the allurements of unlawful love. Beſides, I take care to inſpire him with ſuch reverence for himſelf, that, notwithſtanding all the fury of his deſires, he will not condeſcend to purſue the enjoyments of debauchery. And though I may now ſometimes entruſt him to his own care, and not ſeek to confine him always under my eye; yet ſtill I will be cautious to watch over his conduct with careful circumſpection.

But as Emilius is to be ſhortly introduced to his Sophia, it may perhaps be proper for us to inquire into her character, and in what manner ſhe has been brought up.

41
Diſtinctive characters of the two ſexes.

There is a natural difference between the two ſexes. The difference in the ſtructure of their bodies ſhows them to be deſtined by nature for different purpoſes in life, and muſt neceſſarily occaſion a diſtinction between their characters. It is vain to aſk which of them merits the pre-eminence; each of them is peculiarly fitted to anſwer the views of nature. Woman is naturally weak and timid, man ſtrong and courageous; the one is a dependent, the other a protector. As the guardian of her virtue, and a reſtraint on her deſires, woman is armed with native modeſty. Reaſon is the guide and governor of man. [illegible] man and a woman

man are united by conjugal vows, a violation of thoſe vows is evidently more criminal in the woman than in the man. The wife ought to be anſwerable for the genuineneſs of the offspring with which ſhe has been entruſted by nature. It is no doubt barbarous and wicked for the huſband to defraud his wife of the only reward which ſhe can receive for the ſevere duties of her ſex: but the guilt of the faithleſs wife is ſtill more atrocious; and the conſequences of her infidelity are ſtill more unhappy.

But if nature has eſtabliſhed an original diſtinction between the characters of the two ſexes; has formed them for different purpoſes, and aſſigned them different duties; it muſt follow, that the education of the one ſex ought to be conducted in a manner different from that of the other. The abilities common to the two ſexes are not equally divided between them; but if that ſhare which nature has diſtributed to woman be ſcantier than what ſhe has beſtowed on man, yet the deficiency is more than compenſated by the qualities peculiar to the female. When the woman confines herſelf to aſſert her proper rights, ſhe has always the advantage over man; when ſhe would uſurp thoſe of the other ſex, the advantage is then invariably againſt her.

But we require not that woman ſhould be brought up in ignorance. Let us conſider the delicacy of her ſex, and the duties which ſhe is deſtined to perform; and to theſe we may accommodate the education which we beſtow upon her. While boys like whatever is attended with motion and noiſe, girls are fond of ſuch decorations as pleaſe the eye. Dolls are the favourite plaything of the ſex in their infant years. This is an original taſte, of the exiſtence of which we have the plaineſt evidence. All therefore that we ought to do is, to trace and bring it under proper regulation. Allow the girl to decorate her baby in whatever manner ſhe pleaſes; while employed about that, ſhe will acquire ſuch ſkill and dexterity in thoſe arts which are peculiar to her ſex, that with ſcarce any difficulty ſhe will acquire needle-work, embroidery, and the art of working lace. Her improvements may even be extended as far as deſigning, an art ſomewhat connected with taſte in dreſs; but there is no reaſon that their ſkill in this art ſhould be carried farther than to the drawing of foliage, fruits, flowers, drapery, and ſuch parts of the art as bear ſome relation to dreſs. Always aſſign reaſons for the employment which you give to young girls, but be ſure you keep them conſtantly buſy. They ought to be accuſtomed to laborious induſtry, as well as to bear the abridgment of their liberty. Uſe every art to prevent their work from becoming diſagreeable to them. For that purpoſe, let the mother be careful to make herſelf agreeable. A girl who loves her mother or her aunt, will work cheerfully by them all day; while ſhe to whom her mother is not dearer than all the world beſides, ſeldom turns out well. Never ſuffer girls, even at their diverſions, to be entirely free from reſtraint, nor allow them to run from one amuſement to another. If you now and then detect your daughter uſing a little artifice to excuſe herſelf from obedience, reflect that artifice is, in a certain degree, natural to the fair ſex; and as every natural inclination, when not abuſed, is upright and good, why ſhould it not be cultivated? In order to give girls proper notions of dreſs, let them be taught to conſider ſplendor and elegance of dreſs as deſigned only to conceal the natural defects of the perſon; and to regard it as the nobleſt triumph, the higheſt praiſe, of beauty, to ſhine with unborrowed luſtre in the ſimpleſt attire. Forbid not young women to acquire thoſe arts which have a tendency to render them agreeable. Why refuſe them the indulgence of learning to dance, to ſing, and to ſtudy ſuch other accompliſhments as afterwards enable them to entertain their huſbands? Girls are more diſpoſed to prattle, and at an earlier age, than boys. We may now and then find it neceſſary to reſtrain their volubility. But the proper queſtion to them on ſuch occaſions is not, as to boys, *Of what uſe is this?* but, *What effects will this produce?* At this early period, when they are yet ſtrangers to the diſtinction between good and evil, and therefore unable to form a juſt judgment concerning any perſon's conduct, we ought to reſtrain them carefully from ſaying what may be diſagreeable to thoſe with whom they converſe.

Girls are no leſs incapable than boys of forming diſtinct notions of religion at an early age. Yet, and even for that very reaſon, religious inſtruction ſhould be communicated to them much ſooner than to the youth of the other ſex. Were we to wait the period when their mental faculties arrive at maturity, we might perhaps loſe the happieſt time, from our inability to make a right diſtinction. Since a woman's conduct is ſubject to public opinion, her belief ought therefore to depend, not on reaſon, but on authority. Every girl ought to follow the religion of her mother, every married woman that of her huſband. They cannot derive a rule of faith from their own inquiry. Let us therefore ſeek, not ſo much to inſtruct them in the reaſons of our belief, as to give them clear diſtinct notions of thoſe articles which we require them to believe. Be more careful to inſtruct her in thoſe doctrines which have a connection with morality, than in thoſe myſterious articles which we are required to believe, though we cannot comprehend them.

Such are the principles on which the education of Emilius's unknown miſtreſs has been conducted.

[Notwithſtanding the merit of that part of this treatiſe in which the author entertains us with the courtſhip between his Emilius and Sophia, it does not appear to be ſo intimately connected with the ſubject of education as to render it proper for us to preſent our readers with a view of it. We therefore paſs over the courtſhip, to give a view of our author's ſentiments concerning the advantages to be derived from travelling, and the manner in which it ought to be directed.]

42
Emilius attached to a miſtreſs.

When Emilius has formed a firm attachment to Sophia, and by his aſſiduities has been ſo fortunate as to gain her affections, his great wiſh now is, to be united with her in the bonds of marriage. But as he is ſtill young, is but imperfectly acquainted with the nature of thoſe duties incumbent on him as a member of a particular ſociety, and is even ignorant of the nature of laws and government, I muſt ſeparate him from his Sophia, and carry him to gain a knowledge of theſe things, and of the character and circumſtances of mankind, in various countries, and under various forms of civil government, by travelling. Much has been ſaid con-

43
Travel.

concerning the propriety of ſending young people to travel, in order to complete their education. The multiplicity of books is unfavourable to real knowledge. We read with avidity, and think that by reading we render ourſelves prodigiouſly wiſe. But we impoſe on ourſelves: the knowledge which we acquire from books is a falſe ſpecies of knowledge, that can never render us truly wiſe.

To obtain real knowledge, you muſt obſerve nature with your own eyes, and ſtudy mankind. But to gain this knowledge by travelling, it is not neceſſary that we ſhould traverſe the univerſe. Whoever has ſeen ten Frenchmen, has beheld them all; and whoever has ſurveyed and compared the circumſtances and manners of ten different nations, may be ſaid to know mankind.

To pretend that no advantages may be derived from travelling, becauſe ſome of thoſe who travel return home without having gained much real improvement, would be highly unreaſonable. Young people who have had a bad education, and are ſent on their travels without any perſon to direct or ſuperintend their conduct, cannot be expected to improve by viſiting foreign countries. But they whom nature has adorned with virtuous diſpoſitions, who have been ſo happy as to receive a good education, and go abroad with a real deſign of improvement, cannot but return with an increaſe of virtue and wiſdom. In this manner ſhall Emilius conduct his travels. To induce him to improve in the moſt attentive manner that time which he ſhould ſpend in travelling, I would let him know, that as he had now attained an age at which it might be proper for him to form ſome determination with regard to the plan of his future life, he ought therefore to look abroad into the world, to view the various orders in ſociety, to examine the various circumſtances of mankind, under different forms of government, and in different parts of the globe; and to chooſe his country, his ſtation, and his profeſſion. With theſe views ſhould Emilius ſet out on his travels; and with theſe views, in the courſe of our travels, we ſhould inquire into the origin of ſociety and government, into the nature of thoſe principles by means of which men are united in a ſocial ſtate, into the various circumſtances which have given riſe to ſo many different forms of government, and into the neceſſary relation between government and manners. Our ſtay in the great towns ſhould be but ſhort: for as in them corruption of manners has riſen to a great height, and diſſipation reigns, a long ſtay in any great town might be fatal to the virtuous diſpoſitions of Emilius. Yet his attachment to Sophia would alone be ſufficient to ſave him from the dangers to which his virtue is expoſed. A young man muſt either be in love, or be a debauchee. Inſtances may be pointed out in which virtue has been preſerved without the aid of love; but to ſuch inſtances I can give little credit.

44 Return from his travels, and marriage.

Emilius, however, may now return to his Sophia. His underſtanding is now much more enlightened than when he ſet out on his travels. He is now acquainted with ſeveral forms of government, their advantages and defects, with the characters of ſeveral different nations, and with the effects which difference in circumſtances may be expected to produce on the characters of nations. He has even been ſo fortunate as to get acquainted with ſome perſons of merit in each of the countries which he has viſited. With theſe advantages gained, and with affection unchanged and unabated, he returns to his Sophia. After having made him acquainted with the languages, the natural hiſtory, the government, the arts, cuſtoms, and manners, of ſo many countries, Emilius eagerly informs me that the period which we had deſtined for our travels is now expired. I aſk, What are then his purpoſes for life? He replies, that he is ſatisfied with the circumſtances in which nature has placed him, and with my endeavours to render him independent on fortune, and wiſhes only for his Sophia to be happy. After giving him a few advices for the regulation of his conduct in life, I conduct him to his Sophia, and behold him united with her in marriage. I behold him happy; with affectionate gratitude he bleſſes me as the author of his happineſs; and I thus receive the reward of all the pains with which I have conducted his education.

45 Remarks.

Such are the outlines of the ſyſtem of education propoſed by this ſingular and original genius. For originality of thought, affecting ſentiment, enchanting deſcription, and bold vehement eloquence, this book is one of the nobleſt pieces of compoſition, not only in the French language, but even in the whole compaſs of ancient and modern literature. The irregularity of his method, however, renders it a very difficult taſk to give an abridged view of his work. He conducts his pupil, indeed, from infancy to manhood: But inſtead of being barely a ſyſtem of education, his work is beſides a treaſure of moral and philoſophical knowledge. He has choſen a path, and follows it from the bottom to the ſummit of the hill: yet whenever a flower appears on the right or left hand, he eagerly ſteps aſide to pluck it; and ſometimes, when he has once ſtepped aſide, a new object catches his eye and ſeduces him ſtill farther. Still, however, he returns. His obſervations are in many places looſely thrown together, and many things are introduced, the want of which would by no means have injured either the unity or the regularity of his work. If we attempt to review the principles on which he proceeds in reprobating the prevalent modes of education, and pointing out a new courſe, his primary and leading one ſeems to be, that we ought to watch and ſecond the deſigns of nature, without anticipating her. As the tree bloſſoms, the flowers blow and the fruit ripens each at a certain period; ſo there is a time fixed in the order of nature for the ſenſitive, another for the intellectual, and another for the moral powers of man to diſplay themſelves. We in vain attempt to teach children to reaſon concerning truth and falſehood, concerning right and wrong, before the proper period arrive: We only confound their notions of things, and load their memories with words without meaning; and thus prevent both their reaſoning and moral powers from attaining that ſtrength and acuteneſs of which they are naturally capable. He attempts to trace the progreſs of nature, and to mark in what manner ſhe gradually raiſes the human mind to the full uſe of all its faculties. Upon the obſervations which he has made in tracing the gradual progreſs of the powers of the human mind towards maturity, his ſyſtem is founded.

As it is impoſſible to communicate to the blind any juſt ideas of colours, or to the deaf of ſounds; ſo it muſt be acknowledged, that we cannot poſſibly communicate to children ideas which they have not faculties to comprehend. If they are, for a certain period of life, merely ſenſitive animals, it muſt be folly to treat them during that period as rational and moral beings. But is it a truth that they are, during any part of life, guided ſolely by inſtinct, and capable only of ſenſation? Or, how long is the duration of that period? Has nature unkindly left them to be, till the age of twelve, the prey of appetite and paſſion? So far are the facts of which we have had occaſion to take notice, concerning the hiſtory of infancy and childhood, from leading to ſuch a concluſion, that to us it appears undeniable that children begin to reaſon very ſoon after their entrance into life. When the material world firſt opens on their ſenſes, they are ignorant of the qualities and relations of ſurrounding objects: they know not, for inſtance, whether the candle which they look at be near or at a diſtance; whether the fire with which they are agreeably warmed may alſo affect them with a painful ſenſation. But they remain not long in this ſtate of abſolute ignorance. They ſoon appear to have acquired ſome ideas of the qualities and relative ſituation of bodies. They cannot, however, acquire ſuch ideas, without exerting reaſoning powers in a certain degree. Appearances muſt be compared, and inferences drawn, before knowledge can be gained. It is not ſenſation alone which informs us of the relative diſtances of bodies; nor can ſenſation alone teach us, that the ſame effects which we have formerly obſerved will be again produced by the ſame cauſe.

But if children appear capable of reaſoning at a very early period, they appear alſo to be at a very early period ſubject to the influence of the paſſions: they are angry or pleaſed, merry or ſad, friends or enemies, even while they hang at the breaſt; inſtead of being ſelfiſh, they are naturally liberal and ſocial. And if we obſerve them with candid attention, we will find that the paſſions do not diſplay themſelves ſooner than the moral ſenſe. As nature has wiſely ordered, that we ſhould not ſee, and hear, and feel, without being able to compare and draw inferences from our perceptions; ſo it is a no leſs certain and evident law of nature, that the paſſions no ſooner begin to agitate the human breaſt, than we become able to diſtinguiſh the beauty and the deformity of virtue and vice. The child is not only capable of gratitude and attachment to the perſon who treats him with kindneſs; he is alſo capable of diſtinguiſhing between gratitude and ingratitude, and of viewing each with proper ſentiments. He cries when you refuſe to gratify his deſires; but he boldly inſiſts that he is injured when you uſe him cruelly or unjuſtly. It is indeed impoſſible to attend to the conduct of children during infancy, without being convinced that they are, even then, capable of moral diſtinctions. So little are they acquainted with artificial language, that we and they do not then well underſtand each other. But view their actions; conſider thoſe ſigns by which nature has taught them to expreſs themſelves. Our limbs, our features, and our ſenſes, are not gradually and by piecemeal beſtowed as we advance towards maturity; the infant body comes not into the world mutilated or defective: why then, in point of mental abilities, ſhould we be for a while brutes, without becoming rational and moral beings till the fulneſs of time be accompliſhed? All the differences between the phenomena of manhood and thoſe of infancy and childhood may be accounted for, if we only reflect, that when children come into the world, they are totally unacquainted with all the objects around them; with the appearances of nature, and the inſtitutions of ſociety; that they are ſent into the world in a feeble ſtate, in order that the helpleſſneſs occaſioned by their ignorance may attract the notice and gain the aſſiſtance of thoſe who are able to help them; and that they attain not full ſtrength in the powers either of mind or body, nor a ſufficient acquaintance with nature, with artificial language, and with the arts and inſtitutions of ſociety, till they arrive at manhood.

Even Rouſſeau, notwithſtanding the art with which he lays down his ſyſtem, cannot avoid acknowledging indirectly, on ſeveral occaſions, that our ſocial diſpoſitions, our rational and our moral powers, diſplay themſelves at an earlier period than that at which he wiſhes us to begin the cultivation of them.

But though the great outlines of his ſyſtem be merely theory, unſupported by facts, nay plainly contradictory to facts; yet his obſervations on the impropriety or abſurdity of the prevalent modes of education are almoſt always juſt, and many of the particular directions which he gives for the conducting of education are very judicious. He is often fanciful, and often deviates from the common road, only to ſhow that he is able to walk in a ſeparate path. Yet why ſhould he be oppoſed with ſo much virulence, or branded with ſo many reproachful epithets? His views are liberal and extenſive: his heart ſeems to have glowed with benevolence: his book contains much obſervation of human actions; diſplays an intimate acquaintance with the motives which ſway the human heart; and if not a perfect ſyſtem for education, is yet ſuperior to what any other writers had before done upon the ſubject. It is ſurely true, that we ourſelves often call forth evil paſſions in the breaſts of children, and impreſs them with bad habits: it is no leſs true that we put books in their hands, and load their memory with words, when we ought rather to direct their attention to things, to the phenomena of nature, and the ſimpleſt arts of life. The form in which he has choſen to communicate his ſentiments on the ſubject of education renders the peruſal of it more pleaſing, and his precepts more plain, than they would otherwiſe have been: it is nearly that dramatic form with which we are ſo much delighted in ſome of the nobleſt compoſitions of the ancients.

After viewing the public eſtabliſhments for education which exiſted in ſome of the moſt renowned ſtates of antiquity; and after liſtening to the ſentiments of the experienced Quinctilian, the learned Milton, the judicious Locke, and the bold fanciful Rouſſeau, on this intereſting ſubject; it may now be proper to lay before the reader our own ſentiments concerning the education of youth under a few diſtinct heads.

Indeed, if we were diſpoſed to give abridgments of all the books which have been written on the ſubject of education, or even to hint at all the various modes which have been recommended by teachers or theoriſts, we might ſwell this article to an amazing ſize: Nay, were we only to take notice of the many elegant and ſenſible writers who have of late endeavoured to call the attention of the public to this ſubject, we might extend it to an immoderate length. A Kames, a Prieſtley,

ley, a Knox, a Madame de Sillery, and a Berquin, might well attract and fix our attention. But as, among ſuch a crowd of writers, every thing advanced by each cannot be original; and even of thoſe things which are original only a certain, and that perhaps even a moderate, proportion, can be juſt and judicious; and as they often either borrow from one another, or at leaſt agree in a very friendly manner, though in ſome things they profeſs a determined hoſtility; therefore we ſhall content ourſelves with having taken notice of four of the moſt reſpectable writers on the ſubject.

In preſenting to our readers the reſult of our own obſervations and reflections, we ſhall throw our thoughts nearly under the following heads. The management of children from their birth till they attain the age of five or ſix; from that period till the age of puberty; private and public education; religion and morals; the languages; natural philoſophy; the education of people of rank and fortune; education of perſons deſigned for a mercantile employment, and for the other humbler occupations in active life not particularly connected with literature; education of the female ſex; foreign travel; knowledge of the world; and entrance into active life. We do not pretend to be able to include under theſe heads every thing worthy of notice in the ſubject of education: but under theſe we will be able to comprehend almoſt every thing of importance that has occurred to us on the ſubject.

I. *On the Management of Infants from the Time of their Birth till they attain the Age of five or ſix.*

The young of no other animal comes into the world in ſo helpleſs a ſtate, or continues ſo long to need aſſiſtance, as that of the human ſpecies. The calf, the lamb, and the kid, are vigorous and lively at the inſtant of their birth; require only, for a very ſhort period, nouriſhment and protection from their reſpective dams; and ſoon attain ſuch degrees of ſtrength and activity as to become entirely independent. The infancy of the oviparous animals is not of longer continuance: And, indeed, whatever department of the animal world we may chooſe to ſurvey, we ſtill find that no ſpecies is ſubject to the ſame ſevere laws as man during the firſt period of life.

46
Man compared to other animals in reſpect to the helpleſsneſs of infancy.

Yet the character and the views of man are ſo very different from thoſe of the other animals, that a more careful attention to theſe may perhaps induce us to regard this ſeeming ſeverity rather as an inſtance of the peculiar kindneſs of the Author of nature. From every obſervation which has been hitherto made on the powers and operations of the inferior animals, we are led to conſider them as guided and actuated chiefly, if not ſolely, by inſtinct, appetite, and ſenſation: their views extend not beyond the preſent moment; nor do they acquire new knowledge or prudence as they advance in life. But the character of the human race is much more exalted. We have alſo powers and organs of ſenſation, inſtincts and appetites; but theſe are the moſt ignoble parts of our nature: our rational faculties and moral powers elevate us above the brutes, and advance us to an alliance with ſuperior beings. Theſe rational faculties and moral powers render us capable of ſocial life, of artificial language, of art, of ſcience, and of religion. Now, were one of the ſpecies to come into the world full grown, poſſeſſed of that bodily ſtrength and vigour which diſtinguiſhes manhood, his ignorance would ſtill render him inadequate to the duties of life; nay, would even render him unable to procure means for his ſubſiſtence: while his manly appearance would deprive him of the compaſſion and benevolent aſſiſtance of others; and his ſtrength and vigour would alſo render him leſs docile and obedient than is neceſſary, in order that he may receive inſtruction in the duties and arts of life. Again, were the period of infancy as ſhort to the human ſpecies as to the other animals; were we to be no longer ſubjected to a parent's authority, or protected by his care, than the bird or the quadruped; we ſhould be expoſed to the dangers and difficulties of the world before we had acquired ſufficient knowledge or prudence to conduct us through them, before we had gained any acquaintance with the ordinary phenomena of nature, or were able to uſe the language or practiſe the arts of men in a ſocial ſtate.

Since, then, it is by the benevolence of nature that we are feeble and helpleſs at our entrance into life, and that our progreſs towards maturity is ſlow and gradual; ſince nature has deſtined us to be for a conſiderable time under the care and authority of our parents; and ſince the manner in which we are managed during that early part of life has ſo important an influence on our future character and conduct: it is therefore incumbent on parents to direct that tenderneſs, which they naturally feel for their offspring, in ſuch a manner as to ſecond the views of nature.

47
Dreſs of infants.

When children come into the world, inſtinct directs them to receive nouriſhment from the breaſt, and to claim attention to their pains and wants by crying. We attend to their ſigns, and ſtrive to render them as eaſy as we can. They are waſhed, clothed with ſuch garments as we think moſt ſuitable, and ſuckled either by their mother or by ſome other woman who is conſidered as proper for the purpoſe. The abſurd mode of ſwaddling up infants in ſuch a manner as to confine them almoſt from all motion, and leave ſcarce a limb at liberty, which has been ſo often exclaimed againſt and repreſented as highly injurious to the ſymmetry and vigour of the human frame, is now almoſt entirely laid aſide; and therefore we need not raiſe our voice againſt it. Still, however, there are certainly too many pins and bandages uſed in the dreſs of infants: theſe are unfavourable to the circulation of the blood, impede the growth, and often occaſion thoſe tears and that peeviſhneſs which we raſhly attribute to the natural ill-humour of the poor creatures. Their dreſs ought to be looſe and cool, ſo as to preſs hard on no joint, no vein nor muſcle; and to leave every limb at liberty. If too heavy and cloſe, it may occaſion too copious a perſpiration, and at the ſame time confine the matter perſpired on the ſurface of the ſkin; than which nothing can be more prejudicial to the health of the child. It may alſo, however, be too thin and cool: for as moderate warmth is neceſſary to the vegetation of plants; ſo it is no leſs neceſſary for promoting the growth of animals: and, therefore, though the dreſs of infants ought to be looſe and eaſy, yet ſtill it ſhould be moderately warm.

48
Nurſes.

It is common for mothers in affluent or even in comfortable circumſtances, to forego the pleaſure of nurſing their own children, that they may avoid the fatigues with which it is attended. This practice has long prevailed in various ages and among various nations: it has been often reprobated with all the warmth of paſſion, and all the vehemence of eloquence, as diſhonourable, inhuman, contradictory to the deſigns of nature, and deſtructive of natural affection: yet ſtill it prevails; fathers and mothers are ſtill equally deaf to the voice of nature and the declamations of philoſophers. Indeed, in a luxurious age, ſuch a practice may be naturally expected to prevail. In ſuch an age, they who are poſſeſſed of opulence generally perſuade themſelves, that, to be happy, is to ſpend their time wholly amid diverſions and amuſements, without deſcending to uſeful induſtry, or troubling themſelves about the ordinary duties of life. Influenced by ſuch notions, they think it proper for them to manage their family affairs, and to nurſe and educate their children, by proxy; nay, to do for themſelves nothing that another can perform for them. It is vain to make a furious oppoſition to theſe abſurd notions; the falſe views of happineſs, the pride and the indolence produced by luxury, will ſtill be too powerful for us. We muſt not hope to perſuade the mother, that to receive the careſſes, to behold the ſmiles, and to mark the bodily and mental powers of her child in their gradual progreſs towards maturity, would be more than a ſufficient compenſation for all the fatigues which ſhe would undergo in nurſing and watching over him in his infant years. We need not mention, that the mutual affection between a mother and her child, which is partly the effect of inſtinct, depends alſo, in no inconſiderable degree, on the child's ſpending the period of infancy in its mother's arms; and that when ſhe ſubſtitutes another in her place, the child naturally transfers its affection to the perſon who performs to it the duties of a mother. We need not urge theſe, nor the various other reaſons which ſeem to recommend to every mother the province of ſuckling her own children, and watching over their infant years; for we will either not be heard, or be liſtened to with contempt. Yet we may venture to ſuggeſt, that if the infant muſt be committed to a ſtranger, ſome degree of prudence may be employed in ſelecting the perſon to whom he is to be entruſted. Her health, her temper, and her manner of ſpeaking, muſt be attended to. A number of other qualifications are alſo to be required in a nurſe: but it is rather the buſineſs of the phyſician to give directions with regard to theſe. If her habit of body be any way unhealthy, the conſtitution of the infant that ſucks her milk cannot but be injured: if her temper be rough or peeviſh, the helpleſs child ſubjected to her power will be often harſhly treated; its ſpirit will be broken, and its temper ſoured: if her pronunciation be inarticulate or too rapid, the child may acquire a bad habit when it firſt begins to exert its vocal organs, which will not be eaſily corrected.

49
Influence of treatment in infancy on the abilities and diſpoſitions.

In the milder ſeaſons of the year, infants ought to be frequently carried abroad. Not only is the open air favourable to health, but the freſhneſs, the beauty, the variety, and the lively colours of the ſcenes of nature, have the happieſt effects on the temper, and have even a tendency to enliven and invigorate the powers of the mind. At this period, the faculties of the underſtanding and the diſpoſitions of the heart generally acquire that particular bias, and thoſe diſtinguiſhing features, which characterize the individual during the future part of his life, as quick or dull, mild or paſſionate; and which, though they be generally attributed to the original conformation of the mind by the hand of nature, yet are owing rather to the circumſtances in which we are placed, and the manner in which we are treated, during the firſt part of life.

When children begin to walk, our fondneſs diſpoſes us to adopt many expedients to aſſiſt them. But theſe ſeem to be improper. It is enough for us to watch over them ſo as to guard them from any danger which they might otherwiſe incur by their firſt attempts to move about. Thoſe who adviſe us not to be too anxious to preſerve children from thoſe ſlight hurts to which they are expoſed from their diſpoſition to activity, before they have acquired ſufficient ſtrength or caution, certainly give a judicious piece of advice which ought to be liſtened to. By being too attentive to them, we teach them to be careleſs of themſelves; by ſeeming to regard every little accident which befals them as a moſt dreadful calamity, we inſpire them with timidity, and prevent them from acquiring manly fortitude. When children begin to liſp out a few words or ſyllables, the pleaſure which we feel at hearing them aim at the uſe of our language, diſpoſes us to liſten to them with ſuch attention as to relieve them from the neceſſity of learning an open diſtinct articulation. Thus we teach them to expreſs themſelves in a rapid, indiſtinct, and heſitating manner, which we often find it difficult, ſometimes even impoſſible, to correct, when they are farther advanced. Would we teach them a plain diſtinct articulation, we ought not only to ſpeak plainly and diſtinctly in their preſence, but alſo to diſregard their queſtions and requeſts, if not expreſſed with all the openneſs and diſtinctneſs of pronunciation of which they are capable.

Man is naturally an imitative animal. Scarce any of our natural diſpoſitions is diſplayed at an earlier period than our diſpoſition to imitation. Childrens firſt amuſements are dramatic performances, imitative of the arts and actions of men. This is one proof among others, that even in infancy our reaſoning faculties begin to diſplay themſelves; for we cannot agree with ſome philoſophers, that children are actuated and guided ſolely by inſtinct in their attempts at imitation.

However that be, the happieſt uſe might be made of this principle which diſcovers itſelf ſo early in the infant mind. Whatever you wiſh the child to acquire, do in his preſence in ſuch a manner as to tempt him to imitate you. Thus, without ſouring his mind by reſtraint during this gay innocent period of life, you may begin even now to cultivate his natural powers. Were it impoſſible at this time to communicate any inſtruction to the boy, without baniſhing that ſprightly gaiety which naturally diſtinguiſhes this happy age, it would be beſt to think only how he might loſe his time in the leaſt diſadvantageous manner. But this is far from being neceſſary. Even now the little creature is diſpoſed to imitation, is capable of emulation, and feels a deſire to pleaſe thoſe whoſe kindneſs has gained his affection. Even now his ſentiments and conduct may be influenced by rewards when prudently beſtowed, and by puniſhments when judiciouſly inflicted. Why then ſhould we heſitate to govern him by the ſame principles, by which the laws of God and ſociety aſſert their influence on our own ſentiments and conduct? Indeed, the imprudent manner in which children are too generally managed at this early period, would almoſt tempt us to think it impoſſible to inſtruct them, as yet, without injuring both their abilities and diſpoſitions. But this is owing ſolely to the careleſsneſs, ſtupidity, or capricious conduct of thoſe under whoſe care they are placed.

50
Obedience whether, and when, to be exacted.

Is implicit obedience to be exacted of children? and at what period of life ſhould we begin to enforce it? As children appear to be capable both of reaſoning and of moral diſtinctions at a very early age; and as they are ſo weak, ſo inexperienced, ſo ignorant of the powers of ſurrounding bodies, and of the language, inſtitutions, and arts of men, as to be incapable of ſupporting or conducting themſelves without direction or aſſiſtance; it ſeems therefore proper that they be required even to ſubmit to authority. To the neceſſity of nature both they and we muſt on many occaſions ſubmit. But if the will of a parent or tutor be always found ſcarce leſs unalterable than the neceſſity of nature, it will always meet with the ſame reſpectful ſubmiſſive reſignation. It may not perhaps be always proper to explain to children the reaſons for which we require their obedience: becauſe, as the range of their ideas is much leſs extenſive than ours; as they do not well underſtand our language, or comprehend our modes of reaſoning; and as they are now and then under the influence of paſſion and caprice, as well as people who are farther advanced in life; we are therefore likely to fail in making them comprehend our reaſons, or in convincing them that they are well-grounded. And as it is proper to exact obedience of children; ſo we ſhould begin to require it as ſoon as they become capable of any conſiderable degree of activity. Yet we muſt not confine them like ſlaves, without allowing them to ſpeak, to look, or to move, but as we give the word. By ſuch treatment we could expect only to render them peeviſh and capricious. It will be enough, at firſt, if we let them know that obedience is to be hexacted; and if we reſtrain them only where, if left at liberty, they would be expoſed to imminent danger.

If then, at ſo early a time of life as before the age of five or ſix, it is poſſible to render children obedient, and to communicate to them inſtruction; what arts, or what learning, ought we to teach them at that period? To give a proper anſwer to this queſtion, is no eaſy matter. It ſeems at firſt difficult to determine, whether we ought yet to initiate them in letters. But as their apprehenſion is now quick, and their memory pretty tenacious, there cannot be a more favourable time for this very purpoſe. As ſoon as they are capable of a diſtinct articulation, and ſeem to poſſeſs any power of attention, we may with the greateſt propriety begin to teach them the alphabet. The moſt artful, alluring methods may be adopted to render the horn-book agreeable; or we may uſe the voice of authority, and command attention for a few minutes; but no harſhneſs, no ſeverity, and ſcarce any reſtraint. At the ſame time, it will be proper to allow the little creatures to run much about in the open air, to exerciſe their limbs, and to cultivate thoſe ſocial diſpoſitions which already begin to appear, by playing with their equals.

Such are the thoughts which have ſuggeſted themſelves to us concerning the management of children in mere infancy. What an amiable little creature would the boy or girl be, who were brought up in a manner not inconſiſtent with the ſpirit of theſe few hints? Behold him healthy and vigorous, mild, ſprightly, and cheerful: He is ſubmiſſive and docile, yet not dull or timid; he appears capable of love, of pity, and of gratitude. His mind is hitherto, however, almoſt wholly uninformed: he is acquainted but with a few of the objects around him; and knows but little of the language, manners, and inſtitutions of men: but he feels the impulſe of an ardent curioſity, and all the powers of his mind are alive and active.

II. *On the Management of Children between the Age of five or ſix and the Age of puberty.*

At this period it may be proper, not only to exact obedience, and to call the child's attention for a few minutes now and then to thoſe things of which the knowledge is likely to be afterwards uſeful to him; but we may now venture to require of him a regular ſteady application, during a certain portion of his time, to ſuch things as we wiſh him to learn. Before this time it would have been wrong to confine his attention to any particular taſk. The attempt could have produced no other effect than to deſtroy his natural gaiety and cheerfulneſs, to blunt the native quickneſs of his powers of apprehenſion, and to render hateful that which you wiſhed him to acquire. Now, however, the caſe is ſomewhat different: The child is not yet ſenſible of the advantages which he may derive from learning to read, for inſtance; or even though he were able to foreſee all the advantages which he will obtain by ſkill in the art of reading through the courſe of life; yet is it the character of human nature, at every ſtage of life, to be ſo much influenced by preſent objects in preference to future views, that the ſenſe of its utility alone would not be ſufficient to induce him to apply to it. Even at the age of 12, of 20, of 50; nay, in extreme old age, when reaſon is become very perſpicacious, and the paſſions are mortified; ſtill we are unable to regulate our conduct ſolely by views of utility. Nothing could be more abſurd, therefore, than to permit the child to ſpend his time in fooliſh tricks, or in idleneſs, till views of utility ſhould prompt him to ſpend it in a different manner. No; let us begin early to habituate him to application and to the induſtrious exertion of his powers. By endowing him with powers of activity and apprehenſion, and rendering him capable of purſuing with a ſteady eye thoſe objects which attract his deſires, nature plainly points out to us in what manner we ought to cultivate his earlier years. Beſides, we can command his obedience, we can awaken his curioſity, we can rouſe his emulation, we can gain his affection, we can call forth his natural diſpoſition to imitation, and we can influence his mind by the hope of reward and the fear of puniſhment. When we have ſo many means of eſtabliſhing our authority over the mind of the boy without tyranny or uſurpation; it cannot ſurely be difficult, if we are capable of any moderation and prudence, to cultivate his powers by making him begin at this period to give regular application to ſomething that may afterwards be uſeful.

51
A knowledge of words and of things muſt be learnt at the ſame time.

And if the boy muſt now begin to dedicate ſome portion of his time regularly to a certain taſk, what taſk will be moſt ſuitable? Even that to which children are uſually firſt required to apply; continue teaching him to read. Be not afraid that his abilities will ſuffer from an attention to books at ſo early an age. Say not that it is folly to teach him words before he have gained a knowledge of things. It is neceſſary, it is the deſign of nature, that he ſhould be employed in acquiring a knowledge of things, and gaining an acquaintance with the vocal and written ſigns by which we denote them, at the ſame time. Theſe are intimately connected; the one leads to the other. When you view any object, you attempt to give it a name, or ſeek to learn the name by which men have agreed to diſtinguiſh it: in the ſame manner, when the names of ſubſtances or of qualities are communicated to us, we are deſirous of knowing what they ſignify. At the ſame time, ſo imperfect is the knowledge of nature which children can acquire from their own unaſſiſted obſervation, that they muſt have frequent recourſe to our aſſiſtance before they can form any diſtinct notions of thoſe objects and ſcenes which they behold. Indeed language cannot be taught, without teaching that it is merely a ſyſtem of ſigns, and explaining what each particular ſign is deſigned to ſignify. If, therefore, language is not only neceſſary for facilitating the mutual intercourſe of men, but is even uſeful for enabling us to obtain ſome knowledge of external nature, and if the knowledge of language has a natural tendency to advance our knowledge of things; to acquaint ourſelves with it muſt therefore be regarded as an object of the higheſt importance: it muſt alſo be regarded as one of the firſt objects to which we ought to direct the attention of children. But the very ſame reaſons which prove the propriety of making children acquainted with thoſe artificial vocal ſigns which we uſe to expreſs our ideas of things, prove alſo the propriety of teaching them thoſe other ſigns by which we expreſs theſe in writing. It is poſſible indeed, nay it frequently happens, that we attempt to inſtruct children in language in ſo improper a manner as to confound their notions of things, and to prevent their intellectual powers from making that improvement of which they are naturally capable: but it is alſo poſſible to initiate them in the art of reading, and in the knowledge of language, with better auſpices and happier effects. The knowledge of language may be conſidered as the key by which we obtain acceſs to all the ſtores of natural and moral knowledge.

52
Confinement, how far proper

Though we now agree to confine our pupil to a certain taſk, and have determined that his firſt taſk ſhall be to learn to read; yet we do not mean to require that he be confined to this taſk during the greateſt part of the day, or that his attention be ſeriouſly directed to no other object. To ſubject him to too ſevere reſtraint would produce the moſt unfavourable effects on his genius, his temper, and his diſpoſitions. It is in conſequence of the injudicious management of children, while they are ſometimes ſuffered to run riot, and at other times cruelly confined like priſoners or ſlaves; it is in conſequence of this, that we behold ſo many inſtances of peeviſhneſs, caprice, and invincible averſion to all ſerious application at this period of life. But were a due medium obſerved, were reſtraint duly tempered with liberty and indulgence, nothing would be more eaſy than to diſpoſe children to cheerful obedience, and to communicate to them inſtruction at this age. That part of their time which they are left to enjoy at liberty, they naturally dedicate to their little ſports. The favourite ſports of boys are generally active; thoſe of girls, ſedentary. Of each we may take advantage, to prepare them for the future employments of life. However, neither are the amuſements of boys invariably active, nor thoſe of girls always ſedentary; for, as yet, the manners and diſpoſitions of the two ſexes are diſtinguiſhed rather by habit or accident than by nature. The diſpoſition to activity which characterizes children, is no leſs favourable to health than to their improvement in knowledge and prudence; their active ſports have a tendency to promote their growth and add new vigour to their limbs. Perhaps, even at this time, children might be enticed to learn the elements of natural philoſophy and natural hiſtory amid their amuſements and ſports. Birds, butterflies, dogs, and other animals, are now favourite objects of their care; their curioſity is powerfully rouſed by the appearance of any ſtrange object; and many of the ſimpleſt experiments of natural philoſophy are ſo pleaſing, that they cannot fail to attract the attention even of thoſe who are leaſt under the influence of curioſity. Yet it would be improper to inſiſt on their attention to theſe things as a taſk: if we can make them regard them as amuſements, it will be well; if not, we muſt defer them to ſome happier ſeaſon. They might alſo, by proper management, be led to acquire ſome ſkill in the arts. They build mimic houſes, and fill them with ſuitable furniture; they conſtruct little boats, and ſail them; they will fence in little gardens, and cultivate them; and we even ſee them imitate all the labours of the huſbandman. Such is the pleaſure which man naturally feels in exerting his powers, and in acting with deſign. Let us encourage this diſpoſition. Theſe are the moſt ſuitable amuſements in which they can engage.

53
What books moſt proper.

As the boy's attention to literary objects is ſtill ſuppoſed to be continued, he will ſoon be able to read with ſome correctneſs and facility. It becomes an object of importance, and of no ſmall difficulty, to determine what books are to be put into his hands, and in what manner his literary education is to be conducted. After the child is made acquainted with the names and powers of the letters, with their combination into ſyllables, and with the combination of theſe again into words, ſo that he can read with tolerable facility; it will be proper that the pieces of reading which are put into his hands be ſuch as are deſcriptive of the actions of men, of the ſcenes of external nature, and of the forms and characters of animals. With theſe he is already in ſome degree acquainted: theſe are the objects of his daily attention; beyond them the range of his ideas does not yet extend; and therefore other ſubjects will be likely to render his taſk diſagreeable to him. Beſides, our preſent object is to teach him words: in order to teach him words, we muſt let him know their ſignification; but till he have acquired a very conſiderable knowledge of language, till he have gained a rich fund of ſimple ideas, it will be impoſſible for him to read or to hear with underſtanding on any other ſubject but theſe. And let us not as yet be particularly by cauſing him to act in ſuch a manner as we think moſt proper. Our great buſineſs at preſent is, to make him acquainted with our language, and to teach him in what manner we uſe it to expreſs our ideas. By his own obſervation, and by our inſtruction, he will ſoon become capable of comprehending all that we wiſh to communicate: But let us not be too haſty; the boy cannot long view the actions of mankind, and obſerve the economy of the animal and the vegetable world, without becoming capable of receiving both religious and moral inſtruction when judiciouſly communicated.

54 Writing. As ſoon as the pupil can read and ſpell with tolerable facility, and has acquired ſufficient ſtrength of arm and fingers to hold a pen, it may be proper to initiate him in the art of writing. If this art is not made diſagreeable by the manner in which his application to it is required, he will learn it without difficulty. Childrens natural diſpoſition to imitate, particularly whatever depends on manual operation, renders this art peculiarly eaſy and pleaſing to them when they are not harſhly forced to apply to it, nor ſuffered to get into a habit of performing their taſk with haſte and negligence.

55 Reſtraint. It requires indeed the moſt cautious prudence, the niceſt delicacy, and the moſt artful addreſs, to prevail with children to give a cheerful and attentive application to any appointed taſk. If you are too ſtern and rigid in enforcing application, you may ſeemingly obtain your object: the child ſits motionleſs, and fixes his eye on his book or copy; but his attention you cannot command; his mind is beyond your reach, and can elude your tyranny; it wanders from the preſent objects, and flies with pleaſure to thoſe ſcenes and objects in which it has found delight. Thus you are diſappointed of your purpoſe; and, beſides, inſpire the child with ſuch averſion both to you and to thoſe objects to which you wiſh him to apply, that perhaps at no future period will he view learning otherwiſe than with diſguſt.

56 Gentleneſs. Again, gentleneſs, and the arts of inſinuation, will not always be ſucceſsful. If you permit the child to apply juſt when he pleaſes; if you liſten readily to all his pretences and excuſes; in ſhort, if you ſeem to conſider learning as a matter not of the higheſt importance, and treat him with kindneſs while he pays but little attention and makes but ſlow progreſs; the conſequences of your behaving to him in this manner will be ſcarce leſs unfavourable than thoſe which attend imprudent and unreaſonable ſeverity. It is, however, ſcarce poſſible to give particular directions how to treat children ſo as to allure them to learning, and at the ſame time to command their ſerious attention. But the prudent and affectionate parent and the judicious tutor will not be always unſucceſsful; ſince there are ſo many circumſtances in the condition of children, and ſo many principles in their nature, which ſubject them to our will.

57 Arithmetic. The principles of arithmetic ought to make a part in the boy's education as ſoon as his reaſoning powers appear to have attained ſuch ſtrength and quickneſs that he will be able to comprehend them. Arithmetic affords more exerciſe to the reaſoning powers of child's attention be directed to it at a proper period, if he be allowed to proceed ſlowly, and if care be taken to make him comprehend fully the principles upon which each particular operation proceeds, it will contribute much to increaſe the ſtrength and the acuteneſs of the powers of his underſtanding.

Where the learned languages are regarded as an object worthy of attention, the boy is generally initiated in them about this time, or perhaps earlier. We have reſerved to a ſeparate head the arguments which occur to us for and againſt the practice of inſtructing children in the dead languages; and ſhall therefore only obſerve in this place, that the ſtudy of them ought not to engroſs the learner's attention ſo entirely as to exclude other parts of education.

58 Practical mathematics. From arithmetic our pupil may proceed to the practical branches of the mathematics: And in all of theſe, as well as in every other branch of learning, what you teach him will be beſt remembered and moſt thoroughly underſtood, if you afford him a few opportunities of applying his leſſons to real uſe in life. Geometry and geography are two moſt important branches of education; but are often taught in ſuch a manner, that no real benefit is derived from the knowledge of them. The means which Rouſſeau propoſes for initiating young people in theſe and in ſeveral other of the arts and ſciences are excellent; and if judiciouſly applied, could hardly fail of ſucceſs.

While boys are engaged in theſe and in the languages, they may alſo attend to and cultivate the bodily exerciſes; ſuch as dancing, fencing, and horſemanſhip. Each of theſe exerciſes is almoſt abſolutely neceſſary for one who is deſigned to have intercourſe with the world; and beſides, they have a tendency to render the powers of the body active and vigorous, and even to add new courage and firmneſs to the mind.

59 Firſt exerciſes in compoſition. When our pupil has acquired ſome knowledge of his own and of the learned languages, has gained ſome ſkill in the principles of arithmetic and of practical mathematics, and has received ſome inſtruction in the principles of morality and religion, or even before this time, it will be proper to begin him to the practice of compoſition. Themes, verſions, and letters, the firſt exerciſes in compoſition which the boy is uſually required to perform, none of them ſeems happily calculated for leading him to increaſe his knowledge, or to acquire the power of expreſſing himſelf with eaſe and elegance. Without enlarging on the impropriety or abſurdity of theſe exerciſes, we will venture to propoſe ſomething different, which we cannot help thinking would conduce more effectually to the end in view. It has been already obſerved, that the curioſity of children is amazingly eager and active, and that every new object powerfully attracts their regard: but they cannot view any object without taking notice of its moſt obvious qualities; any animal, for inſtance, without taking notice of its ſhape, its colour, its ſeeming mildneſs or ferocity; and they are generally pretty ready to give an account of any thing extraordinary which they have obſerved. How eaſy then would it be to require them to write down an account of any object expoſed to their obſervation?

tion? The taſk would not be difficult; and every new piece of compoſition which they preſented to us would add ſo much to their knowledge of nature. We might even require ſuch ſpecimens of their accuracy of obſervation and ſkill in language, at times when they enjoyed no opportunities of beholding new or ſurpriſing objects; a tree, a flower, a field, a houſe, an animal, any other ſimple object, ſhould be the ſubject of their exerciſe. After ſome time, we might require them to deſcribe ſomething more various and complex. They might give an account of ſeveral objects placed in a relative ſituation; as, a ſtream, and the vale through which it flows; or, a bird, and the manner in which it conſtructs its neſt; or, of one object ſucceſſively aſſuming various appearances, as the bud, the flower, the apple. Human actions are daily expoſed to their obſervation, and powerfully attract their attention. By and by, therefore, their taſk ſhould be to deſcribe ſome action which had lately paſſed in their preſence. We need not purſue this hint farther; but, if we miſtake not, by theſe means young people might ſooner, and much more certainly, be taught to expreſs themſelves with eaſe and correctneſs in writing, than by any of the exerciſes which they are at preſent cauſed to perform with a view to that. Beſides, they would at the ſame time acquire much more real knowledge. The ſtudy of words would then be rendered truly ſubſervient to their acquiring a knowledge of things.

We cannot deſcend to every particular of that ſeries of education in which we wiſh the boy to be engaged from that period when he firſt becomes capable of ſerious application till he reach the age of puberty. It is not neceſſary that we ſhould, after having given abſtracts of what has been offered to the world by ſo many reſpectable writers on the ſubject.

The few hints which we have thrown out will be ſufficient to ſhow, in general, in what manner we wiſh the youth's education to be conducted during this period. Let the parent and the tutor bear in mind, that much depends on their example, with regard to the diſpoſitions and manners of the youth; and let them carefully ſtrive to form him to gentleneſs, to firmneſs, to patient induſtry, and to vigorous courage: let them, if poſſible, keep him at a diſtance from that contagion with which the evil example of worthleſs ſervants and play-fellows will be likely to infect him. Now is the time for ſowing the ſeeds of piety and virtue: if carefully ſown now, they will ſcarce fail to grow up, and bear fruit in future life.

III. *From Puberty to Manhood.*

This age is every way a very important period in human life. Whether we conſider the change which now takes place in the bodily conſtitution, or the paſſion which now firſt begins to agitate the breaſt, ſtill we muſt regard this as a critical ſeaſon to the youth. The buſineſs of thoſe to whoſe care he is ſtill entruſted, is to watch over him ſo as to prevent the paſſion for the ſex from hurrying him to ſhameful and vicious indulgence, and from ſeducing him to habits of frivolity and indolence; to prevent him from becoming either the ſhameleſs rake, or the trifling coxcomb. Though ſo furious is the impulſe of that appetite which now fires the boſom and ſhoots through the veins of the youth, that to reſtrain him from the exceſſes to which it leads can be no eaſy taſk; yet if his education has been hitherto conducted with prudence, if he is fond of manly exerciſes, active, ſober, and temperate, and ſtill influenced by modeſty and the ſenſe of ſhame; even this may through the bleſſing of heaven be accompliſhed. It is impoſſible to give better directions than thoſe of Rouſſeau for this purpoſe. Let the young man know his ſituation; ſet before him in a ſtriking light the virtue which he may practiſe by reſtraining appetite, and the frightful fatal vices into which he may be hurried. But truſt not to precept, nor to any views which you can lay before him, either of the diſgracefulneſs and the pernicious conſequences of vice, or of the dignity and the happy fruits of virtue. Something more muſt be done. Watch over him with the attention of an Argus; engage him in the moſt active and fatiguing ſports. Carefully keep him at a diſtance from all ſuch company, and ſuch books, as may ſuggeſt to his mind ideas of love, and of the gratification at which it aims. But ſtill all your precautions will not counteract the deſigns of nature; nor do you wiſh to oppoſe her deſigns. The youth under your care muſt feel the impulſe of deſire, and become ſuſceptible of love. Let him then fix his affections on ſome virtuous young woman. His attachment to her will raiſe him above debauchery, and teach him to deſpiſe brutal pleaſures: it will operate as a motive to diſpoſe him to apply to ſuch arts, and to purſue ſuch branches of knowledge, as may be neceſſary for his farther eſtabliſhment in the world. The good ſenſe of Rouſſeau on this head renders it leſs neceſſary for us to enlarge on it; eſpecially as we are to treat of ſome articles ſeparately which regard the management of youth at this period.

IV. *Religion and Morals.*

60
At what age the principles of religion may be taught.

In pointing out the general plan of education which appears to us the moſt proper to be purſued in order to form a virtuous and reſpectable member of ſociety, we took but ſlight notice of the important objects of religion and morals. At what period, and in what manner, ought the principles of religion and morality to be inſtilled into the youthful mind? It has been before obſerved, that children are capable of reaſoning and of moral diſtinctions even at a very early age. But they cannot then comprehend our reaſonings, nor enter into our moral diſtinctions; becauſe they are ſtrangers to our language, and to the artificial manner in which we arrange our ideas when we expreſs them in converſation or in writing. It follows, then, that as ſoon as they are ſufficiently acquainted with our language, it muſt be proper to communicate to them the principles and precepts of morality and religion. Long before this time, they are diligent and accurate obſervers of human actions. For a ſhort period it is merely the external act which they attend to and obſerve: ſoon, however, they penetrate farther; conſcious themſelves of reflection and volition, they regard us alſo as thinking beings; conſcious of benevolent and of unfriendly diſpoſitions, they regard us as acting with deſign, and as influenced by paſſion: naturally imitative animals, they are diſpoſed in their conduct to follow the example which we ſet before them. By our example we may teach them piety and virtue long before it can be proper to offer them religious or moral inſtruction in a formal manner.

We cannot preſume to determine at what particular period children ought to be firſt informed of their relations to God and to ſociety, and of the duties incumbent on them in conſequence of thoſe relations. That period will be different to different children, according to the pains which have been taken, and the means which have been employed, in cultivating their natural powers. Perhaps even where the moſt judicious maxims of education have been adopted, and have been purſued with the happieſt effects, it cannot be ſooner than the age of eight or nine. But even before this period much may be done. Show the child your reverence for religion and virtue; talk in his preſence, and in the plaineſt, ſimpleſt terms, though not directly to him, of the exiſtence of God the creator, the preſerver, and the governor of the world; ſpeak of the conſtant dependance of every creature on the gracious care of that Being; mention with ardour the gratitude and obedience which we owe to him as our great parent and beſt benefactor: next, ſpeak of the mutual relations of ſociety; of the duties of children and parents, of maſters and ſervants, of man to man. At length, when his mind is prepared by ſuch diſcourſes which have paſſed in his preſence without being addreſſed to him, you may begin to explain to him in a direct manner the leading doctrines of religion. He will now be able to comprehend you, when you addreſs him on that important ſubject: the truths which you communicate will make a powerful impreſſion on his mind; an impreſſion which neither the corruption and diſſipation of the world, nor the force of appetite and paſſion, will ever be able to efface.

61
Habit.

Some writers on this ſubject have aſſerted, that youth are incapable of any juſt ideas of religion till they attain a much more advanced age; and have inſiſted, that, for this reaſon, no attempts ſhould be made to communicate to them the articles of our creed in their earlier years. This doctrine, both from its novelty and from its pernicious tendency, has provoked the keeneſt oppoſition. It has, however, been oppoſed rather with keenneſs than with acuteneſs or ſkill. Its opponents ſeem to have generally allowed that children are incapable of reaſoning and of moral diſtinctions; but they have aſcribed wonderful effects to habit. Enrich the memories of children, ſay they, with the maxims of morality, and with the doctrines of religion; teach them prayers, and call them to engage in all the ordinances of religion. What though they comprehend not the meaning of what they learn? What though they underſtand not for what purpoſe you bid them repeat their prayers, nor why you confine them on the Lord's day from their ordinary amuſements? Their powers will at length ripen, and they will then ſee in what they have been employed, and derive the higheſt advantage from the irkſome taſks to which you confined them. You have formed them to habits which they will not be able to lay aſide: After this they cannot but be religious at ſome period of life, even though you have inſpired them with a diſguſt for the exerciſes of religion. Thoſe good people have alſo talked of the principle of *the aſſociation of ideas*. As no man ſtands alone in ſociety, ſay they; ſo no one idea exiſts in the mind ſingle and unconnected with others: as you are connected with your parents, your children, your friends, your countrymen; ſo the idea of a tree, for inſtance, is connected with that of the field in which it grows, of the fruit which it bears, and of contiguous, diſſimilar, and reſembling objects. When any one ſet of related ideas have been often preſented to the mind in connection with one another, the mind at length comes to view them as ſo intimately united, that any particular one among them never fails to introduce the reſt. Reviſit the ſcenes in which you ſpent your earlieſt years; the ſports and companions of your youth naturally ariſe to your recollection. Have you applied to the ſtudy of the claſſics with reluctance and conſtraint, and ſuffered much from the ſeverity of parents and tutors for your indifference to Greek and Latin? you will, perhaps, never through the courſe of life ſee a grammar ſchool, without recollecting your ſufferings, nor look on a Virgil or Homer without remembering the ſtripes and confinement which they once occaſioned to you. In the ſame manner, when religious principles are impreſſed on the mind in infancy in a proper manner, an happy aſſociation is formed which cannot fail to give them a powerful influence on the ſentiments and conduct in future life. But if we have advanced to manhood before being informed of the exiſtence of a Deity, and of our relation to him; the principles of religion, when communicated, no longer produce the ſame happy effects: the heart and the underſtanding are no longer in the ſame ſtate; nor will the ſame aſſociations be formed.

62
Dr Prieſtley's opinion concerning aſſociation of *ideas*.

This doctrine of *the aſſociation of ideas* has been adduced by an ingenious writer, diſtinguiſhed for his diſcoveries in natural philoſophy, and for his labours in controverſial divinity, as an argument in behalf of the propriety of inſtructing youth in the principles of religion even in their earlieſt years. We admire, we eſteem, the ſpirit which has prompted him to diſcover ſo much concern for the intereſts of the riſing generation; but at the ſame time we will not conceal our opinion, that even this argument ought to be urged with caution. Many of the phenomena of human nature may indeed be explained, if we have recourſe to the principle of *aſſociation*. The influence of any principle, religious or moral, depends in a great meaſure on the ideas and images which, in conſidering it, we have been accuſtomed to aſſociate with it in our minds. But what are the ideas or images moſt likely to be aſſociated by children with the doctrines and duties of religion, if we call them to liſten to the one and perform the other at too early a period? Will they be ſuch as may aſſiſt the influence of religion on their ſentiments and conduct in the future part of life? Obſerve the world: Are thoſe who, in infancy, have been moſt rigidly compelled to get their catechiſms by rote, either the moſt pious or the beſt informed in religious matters? Indeed, when we conſider what has been ſaid of the influence of habit, and of the aſſociation of ideas, we cannot help thinking, that any arguments which on the preſent occaſion may be adduced from either of theſe, tend directly to prove, not that we ought to pour in religious inſtruction into the minds of children, without conſidering whether they be qualified to receive it; but, on the contrary, that we ought cautiouſly to wait for and catch the proper ſeaſon;—that ſeaſon when the youthful mind, no longer a ſtranger to our language, our ſentiments, our views of nature, or our manner of reaſoning, will be able to go along with us, when we talk to him of a ſupreme Being, of our condition as dependant and accountable creatures, of truth, benevolence, and juſtice.

We flatter ourſelves, then, that our readers will readily agree with us, 1ſt, That the moral and reaſoning powers of children begin to diſplay themſelves at a very early age, even in infancy. 2dly, That as ſoon as they have made themſelves acquainted with the moſt obvious appearances of nature, and have gained a tolerable knowledge of our language and our manner of arranging our ideas in reaſoning, we may with the greateſt propriety begin to inſtruct them in the principles of religion. 3dly, That the moſt careful and judicious obſervation is neceſſary to enable us to diſtinguiſh the period at which children become capable of receiving religious inſtruction; becauſe, if we either attempt to communicate to them theſe important truths too early, or defer them till towards manhood, we may fail of accompliſhing the great end which we have in view.

63
Catechiſms.

If we can be ſo fortunate as to chooſe the happieſt ſeaſon for ſowing the firſt ſeeds of piety in the infant mind, our next care will be to ſow them in a proper manner. We muſt anxiouſly endeavour to communicate the principles of religion and morality, ſo as they may be eaſieſt comprehended by the underſtanding of the learner, and may make the deepeſt impreſſion on his heart. It would be a matter of the greateſt difficulty to give particular directions on this head. The diſcretion of the parent or tutor muſt here be his guide. We are afraid that ſome of the catechiſms commonly taught are not very happily calculated to ſerve the purpoſe for which they are intended. Yet we do not wiſh that they ſhould be neglected while nothing more proper is introduced in their room. In inſtructing children in the firſt principles of religion, we muſt beware of arraying piety in the gloomy garb, or painting her with the forbidding features, in which ſhe has been repreſented by anchorites, monks, and puritans. No; let her aſſume a pleaſing form, a cheerful dreſs, and an inviting manner. Deſcribe the Deity as the affectionate parent, the benefactor, and though the impartial yet the merciful judge of mankind. Exhibit to them Jeſus Chriſt, the generous friend and ſaviour of the poſterity of Adam, who with ſuch enchanting benevolence hath ſaid, "Suffer little children to come unto me." Repreſent to them his yoke as eaſy, and his burden as light. Inſiſt not on their ſaying long prayers or hearing tedious ſermons. If poſſible, make the doctrines of religion to appear to them as glad tidings, and its duties as the moſt delightful of taſks.

V. *The Languages.*

64
Prejudices againſt claſſical education.

Is the time uſually ſpent in learning the languages uſefully occupied? What advantages can our Britiſh youth derive from an acquaintance with the languages and the learning of Greece and Rome? Would we liſten to many of the fathers, the mothers, and the polite tutors of the preſent age, they will perſuade us, that the time which is dedicated to grammar-ſchools, and to Virgil, Cicero, Homer, and Demoſthenes, is fooliſhly thrown away; and that no advantages can be gained from the ſtudy of claſſical learning. They wiſh their children and pupils to be not merely ſcholars; they wiſh them to acquire what may be uſeful and ornamental when they come to mingle with the world; and for this purpoſe, they think it much better to teach their young people to ſmatter out French, to dance, to fence, to appear in company with invincible aſſurance, and to dreſs in ſuch a manner as may attract the attention of the ladies. Beſides, the tenderneſs and humanity of thoſe people are amazing. They are ſhocked at the idea of the ſufferings which boys undergo in the courſe of a claſſical education. The confinement, the ſtripes, the harſh language, the burdens laid on the memory, and the pain occaſioned to the eyes, during the dreary period ſpent in acquiring a knowledge of Greek and Latin, affect them with horror when they think of them as inflicted on children. They therefore give the preference to a plan of education in which leſs intenſe application is required and leſs ſeverity employed.

65
Prejudices for it.

But, again, there are others who are no leſs warm in their eulogiums on a claſſical education, and no leſs induſtrious in recommending the ſtudy of Greek and Latin, than thoſe are eager in their endeavours to draw neglect on the poliſhed languages of antiquity. With this ſecond claſs, if an adept in Greek and Latin, you are a great and learned man; but without thoſe languages, contemptible for ignorance. They think it impoſſible to inſpire the youthful mind with generous or virtuous ſentiments, to teach the boy wiſdom, or to animate him with courage, without the aſſiſtance of the ancient philoſophers, hiſtorians, and poets. Indeed their ſuperſtitious reverence for the ancient languages, and for thoſe writers whoſe compoſitions have rendered Greece and Rome ſo illuſtrious, leads them to aſcribe many other ſtill more wonderful virtues to a claſſical education.

With which of theſe parties ſhall we join? or ſhall we mediate between them? Is it improper to call youth to the ſtudy of the languages? Is it impoſſible to communicate any uſeful knowledge without them? Or are they, though highly uſeful, yet not always indiſpenſably neceſſary?

66
Utility of claſical learning towards the improvement of our mother tongue.

We have formerly taken notice of one circumſtance in favour of a claſſical education, to which it may be proper to recal the attention of our readers. We obſerved, that the cultivation of claſſical learning has a favourable influence on the living languages. It has a tendency to preſerve their purity from being debaſed, and their analogy from becoming irregular. In ſtudying the dead languages, we find it neceſſary to pay more attention to the principles of grammar than in acquiring our mother-tongue. We learn our native language without attending much to its analogy and ſtructure. Of the numbers who ſpeak Engliſh through the Britiſh dominions, but few are ſkilled in the inflexion of its nouns and verbs, or able to diſtinguiſh between adverbs and conjunctions. Deſirous only of making their meaning underſtood, they are not anxious about purity or correctneſs of ſpeech. They reject not an expreſſion which occurs to them, becauſe it is barbarous or ungrammatical. As they grew up they learned to ſpeak from their mothers, their nurſes, and others about them: they were ſoon able to make known their wants, their wiſhes, and their obſervations, tongue without acquiring any accurate knowledge of its general principles. If theſe people find occaſion to expreſs themſelves in writing, they are ſcarce more ſtudious of correctneſs and elegance in writing than in ſpeaking; or, though they may aſpire after thoſe properties, yet they can never attain them. But ſuch writers or ſpeakers can never refine any language, or reduce it to a regular analogy. Neither can they be expected to diſtinguiſh themſelves as the guardians of the purity and regularity of their native tongue, if it ſhould before have attained an high degree of perfection. But they who, in learning a language different from their native tongue, have found it neceſſary to pay particular attention to the principles of grammar, afterwards apply the knowledge of grammar which they have thus acquired in uſing their mother-tongue; and by that means become better acquainted with its ſtructure, and learn to write and ſpeak it with more correctneſs and propriety. Beſides, the languages of Greece and Rome are ſo highly diſtinguiſhed for their copiouſneſs, their regular analogy, and for various other excellencies, which render them ſuperior to even the chief of modern languages, that the ſtudy of them has a natural tendency to improve and enrich modern languages. If we look backwards to the 15th century, when learning began to revive in Europe, and that ſpecies of learning which began firſt to be cultivated was claſſical literature, we find that almoſt all the languages then ſpoken in Europe were wretchedly poor and barbarous. Knowledge could not be communicated, nor buſineſs tranſacted, without calling in the aid of Latin. Claſſical learning, however, ſoon came to be cultivated by all ranks with enthuſiaſtic eagerneſs. Not only thoſe deſigned to purſue a learned profeſſion, and men of fortune whoſe object was a liberal education without a view to any particular profeſſion; but even the lower ranks, and the female ſex, keenly ſtudied the languages and the wiſdom of Greece and Rome. This avidity for claſſical learning was followed by many happy effects. But its influence was chiefly remarkable in producing an amazing change on the form of the living languages. Theſe ſoon became more copious and regular; and many of them have conſequently attained ſuch perfection, that the poet, the hiſtorian, and the philoſopher, can clothe their thoughts in them to the greateſt advantage. Could we derive no new advantage from the ſtudy of the ancient languages, yet would they be worthy of our care, as having contributed ſo much to raiſe the modern languages to their preſent improved ſtate. But they can alſo conduce to the preſervation and ſupport of thoſe noble ſtructures which have been reared by their aſſiſtance. The intercourſe of nations, the affectation of writers, the gradual introduction of provincial barbariſms, and various other cauſes, have a tendency to corrupt and debaſe even the nobleſt languages. By ſuch means were the languages of Greece and Rome gradually corrupted, till the language uſed by a Horace, a Livy, a Xenophon, and a Menander, was loſt in a jargon unfit for the purpoſes of compoſition. But if we would not diſdain to take advantage of them, the claſſical works in thoſe languages might writers who have rendered them ſo celebrated, will be the firm enemy of barbariſm, affectation, and negligence, whenever they attempt to debaſe his mother-tongue. We venture therefore to aſſert, that when the poliſhed languages of antiquity ceaſe to be ſtudied among us, our native tongue will then loſe its purity, regularity, and other excellencies, and gradually decline till it be no longer known for the language of Pope and of Addiſon; and we adduce it as an argument in behalf of claſſical learning, that it has contributed ſo much to the improvement of the living languages, and is almoſt the only means that can prevent them from being corrupted and debaſed.

For inuring to induſtry.

67 In thoſe plans of education of which the ſtudy of the dead languages does not make a part, proper means are ſeldom adopted for impreſſing the youthful mind with habits of induſtry: nor do the judgment, the memory, and the other powers of the mind, receive equal improvement, as they paſs not through the ſame exerciſes as in a claſſical education. Let us enter thoſe academies where the way to a complete education leads not through the thorny and rugged paths of claſſical literature; let us attend to the exerciſes which the polite teachers cauſe their pupils to perform. Do they inſiſt on laborious induſtry or intenſe application? No; they can communicate knowledge without requiring laborious ſtudy. They profeſs to allow their pupils to enjoy the ſweets of idleneſs, and yet render them prodigies of learning. But are their magnificent promiſes ever fulfilled? Do they indeed cultivate the underſtandings of the young people intruſted to their care? They do not: their care is never once directed to this important object. To adorn them with ſhowy and ſuperficial qualities, is all that thoſe gentlemen aim at. Hence, when their pupils come to enter the world and engage in the duties of active life, they appear deſtitute of every manly qualification. Though they have attained the age and grown up to the ſize of manhood, their underſtandings are ſtill childiſh and feeble: they are capricious, unſteady, incapable of induſtry or fortitude, and unable to purſue any particular object with keen, unremitting perſeverance. That long ſeries of ſtudy and regular application, which is requiſite in order to attain ſkill in the ancient languages, produces much happier effects on the youthful mind. The power of habit is univerſally felt and acknowledged. As he who is permitted to trifle away the earlieſt part of his life in idleneſs or in frivolous occupations, can ſcarce be expected to diſplay any manly or vigorous qualities when he reaches a more mature age; ſo, on the contrary, he whoſe earlier days have been employed in exerciſing his memory and furniſhing it with valuable treaſures, in cultivating his judgment and reaſoning powers by calling the one to make frequent diſtinctions between various objects, and the other to deduce many inferences from the compariſon of the various objects preſented to the underſtanding, and alſo in ſtrengthening and improving the acuteneſs of his moral powers by attending to human actions and characters, and diſtinguiſhing between them, as virtuous [illegible] vicious, as mean or glorious: he who has thus cul[illegible] his powers, may be naturally ex-

expected to diſtinguiſh himſelf when he comes to perform his part in active life, by prudence, activity, firmneſs, perſeverance, and moſt of the other noble qualities which can adorn a human character. But in the courſe of a claſſical education, the powers of the mind receive this cultivation; and therefore theſe happy effects may be expected to follow from it. The repetitions which are required afford improving exerciſe to the memory, and ſtore it with the moſt valuable treaſures: the powers of the underſtanding are employed in obſerving the diſtinctions between words; in tracing words to the ſubſtances and qualities in nature which they are uſed to repreſent; in comparing the words and idioms of different languages, and in tracing the laws of their analogy and conſtruction; while our moral faculties are at the ſame time improved, by attending to the characters which are deſcribed, and the events and actions which are related, in thoſe books which we are directed to peruſe in order to acquire the ancient languages. We aſſert therefore, that the ſtudy of the ancient languages is particularly uſeful for improving and ſtrengthening all the powers of the mind; and, by that means, for preparing us to act our part in life in a becoming manner: and this our readers will readily agree with us in conſidering as a weighty argument in behalf of that plan of education.

68 Fund of uſeful and elegant knowledge which ancient authors afford.

But if, after all, claſſical learning is ſtill to be given up, where ſhall we find the ſame treaſures of moral wiſdom, of elegance, and of uſeful hiſtorical knowledge, which the celebrated writers of Greece and Rome afford? Will you content yourſelf with the modern writers of Italy, France, and England? Or will you deign to ſurvey the beauties of Homer and Virgil through the medium of a tranſlation? No ſurely; let us penetrate to thoſe ſources from which the modern writers have derived moſt of the excellencies which recommend them to our notice; let us diſdain to be impoſed upon by the whims or the ignorance of a tranſlator.

Juvat integros accedere fontes.

Farther, claſſical learning has long been cultivated among us; and both by the ſtores of knowledge which it has conveyed to the mind, and the habits which it has impreſſed, has contributed in no ſmall degree to form many illuſtrious characters. In reviewing the annals of our country, we will ſcarce find an eminent politician, patriot, general, or philoſopher, during the two laſt centuries, who did not ſpend his earlier years in the ſtudy of the claſſics.

Yet though we have mentioned theſe things in favour of claſſical literature, and were we to deſcend to minute particulars might enumerate many more facts and circumſtances to recommend it; we mean not to argue that it is abſolutely impoſſible to be a wiſe, a great, or a good man, unleſs you are ſkilled in Greek and Latin. Means may, no doubt, be adopted to inſpire the young mind with virtuous diſpoſitions, to call forth the powers of the youthful underſtanding, and to impreſs habits of induſtry and vigorous perſeverance, without having recourſe to the diſcipline of a grammar ſchool. But we cannot help thinking, for the reaſons which we have ſtated to our readers, that a claſſical education is the moſt likely to produce theſe happy effects.

As we are afterwards to take particular notice of the courſe of education moſt ſuitable for thoſe who are to occupy the humble ſtations in ſociety, we ſhall not here inquire whether it be proper to introduce them to an acquaintance with the Greek and Latin claſſics.

VI. *On the Education of People of Rank and Fortune.*

69 Duties of people of rank.

THOSE whom the kindneſs of Providence has placed in an elevated ſtation, and in affluent circumſtances, ſo that they ſeem to be born rather to the enjoyment of wealth and honours than to act in any particular profeſſion or employment, have notwithſtanding a certain part aſſigned them to perform, and many important duties to fulfil. They are members of ſociety, and enjoy the protection of the civil inſtitutions of that ſociety to which they belong; they muſt therefore contribute what they can to the ſupport of thoſe inſtitutions. The labours of the induſtrious poor are neceſſary to ſupply them with the luxuries of life; and they muſt know how to diſtribute their wealth with prudence and generoſity among the poor. They enjoy much leiſure; and they ought to know how to employ their leiſure hours in an innocent and agreeable manner. Beſides, as their circumſtances enable them to attract the regard and reſpect of thoſe who are placed in inferior ſtations, and as the poor are ever ready to imitate the conduct of their ſuperiors; it is neceſſary that they endeavour to adorn their wealth and honours by the moſt eminent virtues, in order that their example may have an happy influence on the manners of the community.

There education ought therefore to be conducted with a view to theſe ends. After what we have urged in favour of a claſſical education, our readers will naturally preſume that we regard it as highly proper for a man of fortune. 70 How to form the temper of a young man of fortune. The youth who is deſtined to the enjoyment of wealth and honours, cannot ſpend his earlier years more advantageouſly than in gaining an acquaintance with the elegant remains of antiquity. The benefits to be derived from claſſical learning are peculiarly neceſſary to him. Care muſt be taken to preſerve him from acquiring an haughty, fierce, imperious temper. The attention uſually paid to the children of people of fortune, and the fooliſh fondneſs with which they are too often treated, have a direct tendency to inſpire them with high notions of their own importance, and to render them paſſionate, overbearing, and conceited. But if their temper acquire this bias even in childhood, what may be expected when they advance towards manhood, when their attention is likely to be oftener turned to the dignity and importance of that rank which they occupy, and to the pitiful humility of thoſe beneath them? Why, they are likely to be ſo proud, inſolent, reſentful, and revengeful, as to render themſelves diſagreeable and hateful to all who know them; and beſides, to be incapable of thoſe delightful feelings which attend humane, benevolent, and mild diſpoſitions. Let the man of fortune, therefore, as he is concerned for the future happineſs and dignity of his child, be no leſs careful to prevent him from being treated in ſuch a manner as to be inſpired with haughtineſs, caprice, and inſolence, than to prevent his mind from being ſoured by harſh and tyrannical uſage.

The manly exerciſes, as they are favourable to the health, the ſtrength, and even the morals; ſo they are highly worthy of engaging the attention of the young gentleman. Dancing, fencing, running, horſemanſhip, the management of the muſket, and the motions of military diſcipline, are none of them unworthy of occupying his time, at proper ſeaſons. It is unneceſſary to point out the advantages which he may derive from dancing; theſe ſeem to be pretty generally underſtood. Perhaps our men of fortune would be aſhamed to make uſe of their legs for running; but occaſions may occur, on which even this humble accompliſhment may be uſeful. Though we wiſh not to ſee the young man of fortune become a jockey; yet to be able to make a graceful appearance on horſeback, and to manage his horſe with dexterity, will not be unworthy of his ſtation and character. If times of public danger ſhould ariſe, and the ſtate ſhould call for the ſervices of her ſubjects againſt any hoſtile attack, they whoſe rank and fortune place them in the moſt eminent ſtations will be firſt expected to ſtand forth; but if unacquainted with thoſe exerciſes which are connected with the military art, what a pitiful figure muſt they make in the camp, or on the field of battle?

71 Law. As the man of fortune may perhaps enjoy by hereditary right, or may be called by the voice of his fellow-citizens, to a ſeat among the legiſlative body of his country; he ought in his youth to be carefully inſtructed in the principles of her political conſtitution, and of thoſe laws by which his own rights and the rights of his fellow-citizens are determined and ſecured.

72 Philoſophy. Natural philoſophy, as being both highly uſeful and entertaining, is well worthy of the attention of all who can afford to appropriate any part of their time to ſcientific purſuits; to the man of fortune, a taſte for natural philoſophy might often procure the moſt delightful entertainment. To trace the wonders of the planetary ſyſtems, to mark the proceſs of vegetation, to examine all the properties of that fine element which we breathe, to trace the laws by which all the different elements are confined to their proper functions, and above all to apply the principles of natural philoſophy in the cultivation of the ground, are amuſements which might agreeably and innocently occupy many of the leiſure hours of the man who enjoys a ſplendid and independent fortune.

73 Hiſtory and morals. Neither do we ſuppoſe civil hiſtory and the principles of morals to be overlooked. Without being acquainted with theſe, how could any juſt or accurate knowledge of the laws and political conſtitution of his country be acquired by the young gentleman? Hiſtory expoſes to our obſervation the fortune and the actions of other human beings, and thus ſupplies in ſome meaſure the place of experience; it teaches prudence, and affords exerciſe to the moral ſenſe. When hiſtory condeſcends to take notice of individuals, they are almoſt always ſuch as have been eminent for virtue, for abilities, or for the rank which they held in life; to the rich and great it ought to ſpeak with peculiar efficacy, and they ought to be carefully invited to liſten to its voice.

Such then is the manner in which we wiſh the education of young men of rank and fortune to be conducted, in order that they may be prepared for enjoying their opulence and honours with becoming dignity. Let them be early inured to habits of vigorous induſtry and perſevering firmneſs, by paſſing through a regular courſe of claſſical learning in a free ſchool; let them play and converſe with their equals, and not be permitted to form high ideas of their own importance, nor to domineer over ſervants or inferiors: Let them be carefully inſtructed in the principles of morality and religion: Let them be taught the manly exerciſes: Let them be carefully informed of the nature of the political conſtitution of their country, and of the extent of thoſe civil and political rights which it ſecures to them and their fellow-citizens: Let them be called to trace the annals of mankind through the records of hiſtory; to mark the appearances and operations of nature, and to amuſe themſelves by purſuing theſe to their general cauſes. We ſay nothing of cauſing the young man of fortune to learn ſome mechanical art: We think ſkill in a mechanical art might now and then afford him an innocent and pleaſing amuſement; but we do not conſider it as abſolutely neceſſary, and therefore do not inſiſt on his acquiring it. With thoſe accompliſhments we hope he might become an uſeful member of ſociety, might adorn the rank and fortune to which he is born, and might find wealth and high ſtation a bleſſing, not a curſe. It is peculiarly unfortunate for our age and country, that people of rank and fortune are not ſo ſtudious that their children acquire theſe as the more ſuperficial accompliſhments.

VII. *On the Education of People deſigned for a Mercantile Employment, and for the humbler Occupations in Life not particularly connected with Literature.*

74 Elegant literature.

Were modern literature in a leſs flouriſhing ſtate; were the Engliſh and French languages adorned with fewer eminent poetical, hiſtorical, and philoſophical compoſitions; we might perhaps inſiſt on it as neceſſary to give the boy, who is deſigned for a mercantile employment, a claſſical education. At preſent this does not appear abſolutely neceſſary; yet we do not preſume to forbid it as improper. Even the merchant will ſcarce find reaſon to repent his having been introduced to the acquaintance of Plato and Cicero. But ſtill, if the circumſtances of the parent, or any other juſt reaſon, ſhould render it inconvenient to ſend the young man who is intended for trade to a free ſchool to ſtudy the ancient languages, means may be eaſily adopted to make up for his loſs. Confine him not to writing and accounts alone. Theſe, though particularly uſeful to the merchant, have no great power to reſtrain the force of evil paſſions, or to inſpire the mind with generous and virtuous ſentiments. Though you burden him not with Latin and Greek, yet ſtrive to inſpire him with a taſte for uſeful knowledge and for elegant literature. Some of the pureſt and moſt elegant of our poets, the excellent periodical works which have appeared in our language, ſuch as the Spectator, the Adventurer, the Mirror, and the compoſitions of our Britiſh hiſtorians, together with ſome of the beſt tranſlations of the claſſics which we poſſeſs; theſe you may with great propriety put into his hands. They will teach him how to think and reaſon juſtly, and to expreſs himſelf in converſation or in writing with correctneſs and elegance: they will refine and poliſh his mind, and raiſe him above low and groſs pleaſures. And as no man, who has any occaſion to ſpeak or write, ought to be entirely ignorant of the principles of grammar, you will therefore be careful to inſtruct the young man who is deſigned for a mercantile occupation in the grammar of his mother-tongue.

75 Integrity. A ſacred regard to his engagements, and an honeſty which may prevent him from taking undue advantages or exacting unreaſonable profits, are the virtues which a merchant is moſt frequently called to exerciſe: punctuality and integrity are the duties moſt particularly incumbent on the mercantile profeſſion. Temptations will now and then ariſe to ſeduce the merchant to the violation of theſe. But if ſuperior to every ſuch temptation, he is one of the moſt illuſtrious characters, and is likely to be one of the moſt ſucceſsful merchants. From his earlieſt years, then, labour to inſpire the child whom you intend for trade with a ſacred regard for truth and juſtice: let him be taught to view deceit and fraud, and the violation of a promiſe, with abhorrence and diſdain. Frugality is a virtue which, in the preſent age, ſeems to be antiquated or proſcribed. Even the merchant often appears better ſkilled in the arts of profuſion than in thoſe of parſimony. The miſer, a character at no time viewed as amiable, is at preſent beheld with double deteſtation and contempt. Yet, notwithſtanding theſe unfavourable circumſtances, fear not to impreſs on the young merchant habits of frugality. Let him know the folly of beginning to ſpend a fortune before he have acquired it. Let him be taught to regard a regular attention to confine his expences within due bounds, as one of the firſt virtues which can adorn his character.

76 Induſtry. Frugality and induſtry are ſo cloſely connected, that when we recommend the one of them to the merchant, we will be naturally underſtood to recommend the other alſo. It is eaſy to ſee, that, without induſtrious application, no man can reaſonably expect to meet with ſucceſs in the occupation in which he engages: and if the merchant thinks proper to leave his buſineſs to the management of clerks and ſhop-keepers, it is not very probable that he will quickly accumulate a fortune. It is, therefore, no leſs neceſſary, that he who is intended for trade be early accuſtomed to habits of ſober application, and be carefully reſtrained from volatility and levity, than that he be inſtructed in writing, arithmetic, and keeping of accounts.

With theſe virtues and qualifications the merchant is likely to be reſpectable, and not unſucceſsful, while he continues to proſecute his trade; and if, by the bleſſing of Providence, he be at length enabled to accumulate a moderate fortune, his acquaintance with elegant literature, and the virtuous habits which he has acquired, will enable him to enjoy it with taſte and dignity. Indeed, all the advantages which a man without taſte, or knowledge, or virtue, can derive from the poſſeſſion of even the moſt ſplendid fortune, are ſo inconſiderable, that they can be no adequate reward for the toil which he undergoes, and the mean arts which he practiſes in acquiring it. At the head of a great fortune a fool can only make himſelf more ridiculous, and a man of a wicked and vicious character more generally abhorred, than if fortune had kindly concealed their crimes and follies by placing them in a more obſcure ſtation.

77 Education of perſons in the loweſt ranks. A conſiderable part of the members of ſociety are placed in ſuch circumſtances, that it is impoſſible for them to receive the advantages of a liberal education. The mechanic and the huſbandman, who earn a ſubſiſtence by their daily labour, can ſeldom afford, whatever parental fondneſs may ſuggeſt, to favour their children with many opportunities of literary inſtruction. Content if they can provide them with food and raiment till ſuch time as they acquire ſufficient ſtrength to labour for their own ſupport, parents in thoſe humble circumſtances ſeldom think it neceſſary that they ſhould concern themſelves about giving their children learning. Happily it is not requiſite that thoſe who are deſtined to ſpend their days in this low ſphere ſhould be furniſhed with much literary or ſcientific knowledge. They may be taught to read their mother tongue, to write, and to perform ſome of the moſt common and the moſt generally uſeful operations of arithmetic: for without an acquaintance with the art of reading, it will ſcarce be poſſible for them to acquire any rational knowledge of the doctrines and precepts of religion, or of the duties of morality; the invaluable volume of the ſacred ſcriptures would be ſealed to them: we may allow them to write, in order that they may be enabled to enjoy the ſweet ſatisfaction of communicating accounts of their welfare to their abſent friends; and, beſides, both writing and arithmetic are neceſſary for the accompliſhment of thoſe little tranſactions which paſs among them. It would be hard, if even the loweſt and pooreſt were denied theſe ſimple and eaſily acquired branches of education; and happily that degree of ſkill in them which is neceſſary for the labourer and the mechanic may be atained without greater expence than may be afforded by parents in the meaneſt circumſtances. Let the youth who is born to paſs his days in this humble ſtation be carefully taught to conſider honeſt patient induſtry as one of the firſt of virtues: let him be taught to regard the ſluggard as one of the moſt contemptible of characters: teach him contentment with his lot, by letting him know that wealth and honour ſeldom confer ſuperior happineſs: Yet ſcruple not to inform him, that if he can raiſe himſelf above the humble condition to which he was born, by honeſt arts, by abilities virtuouſly exerted, he may find ſome comfort in affluent circumſtances, and may find reaſon to rejoice that he has been virtuous, induſtrious, and active. In teaching him the principles of religion, be careful to ſhow him religion as intimately connected with morality: teach him none of thoſe myſterious doctrines, whoſe ſole tendency is to foſter that enthuſiaſm which naturally prevails among the vulgar, and to perſuade them that they may be pious without being virtuous. Labour to inſpire him with an invincible abhorrence for lying, fraud, and theft. Inſpire him with an high eſteem for chaſtity, and with an awful regard to the duties of a ſon, an huſband, and a father. Thus may he become reſpectable and happy, even in his humble ſtation and indigent circumſtances; a character infinitely ſuperior, in the eyes of both God and man, to the rich and great man who miſemploys his wealth and leiſure in ſhameful and vicious purſuits.

VIII. *On the Education of the Female Sex.*

The abſtracts which we have given of ſome of the moſt celebrated and original treatiſes on education, as well as our own obſervations on this ſubject, have been hitherto either relative to the education of both the ſexes, or directed chiefly to the education of the male ſex. But as there is a natural difference between the characters of the two ſexes, and as there are certain duties peculiar to each of them; it is eaſy to ſee that the education of the boy and that of the girl cannot, ought not, to be conducted preciſely in the ſame manner. And ſince the duties of the female ſex are ſo important to ſociety, and they form ſo conſiderable a part of our ſpecies; their education, therefore, merits the higheſt attention.

78 Similarity of the characters of both ſexes in the firſt period of life.

In infancy, the inſtincts, the diſpoſitions, and the faculties of boys and girls ſeem to be nearly the ſame. They diſcover the ſame curioſity, and the ſame diſpoſition to activity. For a while they are fond of the ſame ſports and amuſements. But by and by, when we begin to make a diſtinction in their dreſs; when the girl begins to be more confined to a ſedentary life under her mother's eye, while the boys are permitted to ramble about without doors; the diſtinction between their characters begins to be formed, and their taſte and manners begin to become different. The boy now imitates the arts and the active amuſements of his father; digs and plants a little garden, builds a houſe in miniature, ſhoots his bow, or draws his little cart; while the girl, with no leſs emulation, imitates her mother, knits, ſews, and dreſſes her doll. They are no longer merely children: the one is now a girl; the other a boy. This taſte for female arts, which the girl ſo eaſily and naturally acquires, has been judiciouſly taken notice of by Rouſſeau, as affording an happy opportunity for inſtructing her in a very conſiderable part of thoſe arts which it is proper to teach her. While the girl is buſied in adorning her doll, ſhe inſenſibly becomes expert at needle-work, and learns how to adjuſt her own dreſs in a becoming manner. And therefore, if ſhe be kindly treated, it will not be a matter of difficulty to prevail with her to apply to theſe branches of female education. Her mother or governeſs, if capable of managing her with mildneſs and prudence, may teach her to read with great facility. For being already more diſpoſed to ſedentary application than the boy of the ſame age, the confinement to which ſhe muſt ſubmit in order to learn to read will be leſs irkſome to her. Some have pretended that the reaſoning powers of girls begin to exert themſelves ſooner than thoſe of boys. But, as we have already declared our opinion, that the reaſoning powers of children of both ſexes begin to diſplay themſelves at a very early period; ſo we do not believe that thoſe of the one ſex begin to appear, or attain maturity, ſooner than thoſe of the other. But the different occupations and amuſements in which we cauſe them to engage from their earlieſt years, naturally call forth their powers in different manners, and perhaps cauſe the one to imitate our modes of ſpeaking and behaviour ſooner than the other. However, as we wiſh both boys and girls to learn the art of reading at a very early age, even as ſoon as they are capable of any ſerious application; ſo we wiſh girls to be taught the art of writing, arithmetic, and the principles of religion and morals, in the ſame order in which theſe are inculcated on boys.

We need not point out the reaſons which induce us to regard theſe as accompliſhments proper for the female ſex: they ſeem to be generally conſidered as not only ſuitable, but neceſſary. It is our moſt important privilege, as beings placed in a ſituation different from that of the inferior animals, that we are capable of religious ſentiments and religious knowledge; it therefore becomes us to communicate religious inſtruction with no leſs aſſiduity and care to the youth of the female ſex than to thoſe of our own. Beſides, as the care of children during their earlier years belongs in a particular manner to the mother; ſhe, therefore, whom nature has deſtined to the important duties of a mother, ought to be carefully prepared for the proper diſcharge of thoſe duties, by being accurately inſtructed, in her youth, in ſuch things as it will be afterwards requiſite for her to teach her children.

79 Erudition, how far becoming in ladies.

Ladies have ſometimes diſtinguiſhed themſelves as prodigies of learning. Many of the moſt eminent geniuſes of the French nation have been of the female ſex. Several of our countrywomen have alſo made a reſpectable figure in the republic of letters. Yet we cannot approve of giving girls a learned education. To acquire the accompliſhments which are more proper for their ſex, will afford ſufficient employment for their earlier years. If they be inſtructed in the grammar of their mother-tongue, and taught to read and ſpeak it with propriety; be taught to write a fair hand, and to perform with readineſs the moſt uſeful operations of arithmetic: if they be inſtructed in the nature of the duties which they owe to God, to themſelves, and to ſociety; this will be almoſt all the literary inſtruction neceſſary for them. Yet we do not mean to forbid them an acquaintance with the literature of their country. The periodical writers, who have taught all the duties of morality, the decencies of life, and the principles of taſte, in ſo elegant and pleaſing a manner, may with great propriety be put into the hands of our female pupil. Neither will we deny her the hiſtorians, the moſt popular voyages and travels, and ſuch of our Britiſh poets as may be put into her hands without corrupting her heart or inflaming her paſſions. But could our opinion or advice have ſo much influence, we would endeavour to perſuade our countrymen and countrywomen to baniſh from among them the noveliſts, thoſe panders of vice, with no leſs determined ſeverity than that with which Plato excludes the poets from his republic, or that with which the converts to Chriſtianity, mentioned in the Acts, condemned their magical volumes to the flames. Unhappily, novels and plays are almoſt the only ſpecies of reading in which the young people of the preſent age take delight; and nothing has contributed more effectually to bring on that diſſoluteneſs of manners which prevails among all ranks.

80 Ornamental accompliſhments.

But we will not diſcover ſo much auſterity as to expreſs a wiſh that the education of the female ſex ſhould be confined ſolely to ſuch things as are plain and uſeful. We forbid not thoſe accompliſhments which are merely ornamental, and the deſign of which is to render them amiable in the eyes of the other ſex. When we conſider the duties for which they are deſtined by nature, we find that the art of pleaſing conſtitutes no inconſiderable part of theſe; and it would be wrong, therefore, to deny them thoſe arts, the end of which is to enable them to pleaſe. Let them endeavour to acquire taſte in dreſs: to dreſs in a neat graceful manner, to ſuit colours to her complexion, and the figure of her clothes to her ſhape, is no ſmall accompliſhment for a young woman. She who is rigged out by the taſte and dexterity of her maid and her milliner, is nothing better than a doll ſent abroad to public places as a ſample of their handywork. Dancing is a favourite exerciſe; nay, we might almoſt call it the favourite ſtudy of the fair ſex: So many pleaſing images are aſſociated with the idea of dancing; dreſs, attendance, balls, elegance and grace of motion irreſiſtible, admiration, and courtſhip: and theſe are ſo early inculcated on the young by mothers and maids, that we need not be ſurpriſed if little Miſs conſider her leſſon of dancing as a matter of much more importance than either her book or ſampler. And indeed, though the public in general ſeem at preſent to place too high a value on dancing; and though the undue eſtimation which is paid to it ſeems owing to that taſte for diſſipation, and that rage for public amuſements, which naturally prevail amid ſuch refinement and opulence; yet ſtill dancing is an accompliſhment which both ſexes may cultivate with conſiderable advantage. It has an happy effect on the figure, the air, and the carriage; and we know not if it be not favourable even to dignity of mind: Yet, as to be even a firſt-rate poet or painter, and to value himſelf on his genius in theſe arts, would be no real ornament to the character of a great monarch; ſo any very ſuperior ſkill in dancing muſt ſerve rather to diſgrace than to adorn the lady or the gentleman. There are ſome arts in which, though a moderate degree of ſkill may be uſeful or ornamental, yet ſuperior taſte and knowledge are rather hurtful, as they have a tendency to ſeduce us from the more important duties which we owe to ourſelves and to ſociety. Of thoſe, dancing ſeems to be one: It is ſaid of a certain Roman lady, by an eloquent hiſtorian, "that ſhe was more ſkilled in dancing than became a modeſt and virtuous woman."

81 Dancing.

82 Muſic.

Muſic, alſo, is an art in which the youth of the female ſex are pretty generally inſtructed; and if their voice and ear be ſuch as to enable them to attain any excellence in vocal muſic, it may conduce greatly to increaſe their influence over our ſex, and may afford a pleaſing and elegant amuſement to their leiſure hours. The harpſichord and the ſpinnet are inſtruments often touched by female hands; nor do we preſume to forbid the ladies to exerciſe their delicate fingers in calling forth the enchanting ſounds of theſe inſtruments. But ſtill, if your daughter have no voice or ear for muſic, compel her not to apply to it.

83 Drawing.

Drawing is another accompliſhment which generally enters into the plan of female education. Girls are uſually taught to aim at ſome ſcratches with a pencil: but when they grow up, they either lay it totally aſide, or elſe apply to it with ſo much aſſiduity as to neglect their more important duties. We do not conſider ſkill in drawing, any more than ſkill in poetry, as an accompliſhment very neceſſary for the ladies; yet we agree with Rouſſeau, that as far as it can contribute to improve their taſte in dreſs, it may not be improper for them to purſue it. They may very properly be taught to ſketch and colour flowers; but we do not wiſh them to forget or lay aſide this as ſoon as the drawing-maſter is diſmiſſed: let them retain it to be uſeful through life. Though pride can never be lovely, even in the faireſt female form; yet ought the young woman to be carefully impreſſed with a due reſpect for herſelf. This will join with her native modeſty to be the guardian of her virtue, and to preſerve her from levity and impropriety of conduct.

Such are the hints which have occurred to us on the education proper for the female ſex, as far as it ought to be conducted in a manner different from that of the male.

IX. *Public and private Education.*

One queſtion uſually diſcuſſed by the writers on this ſubject has not hitherto engaged our attention. It is, Whether it be moſt proper to educate a young man privately, or ſend him to receive his education at a public ſchool? This queſtion has been ſo often agitated, and by people enjoying opportunities of receiving all the information which experience can furniſh on the ſubject, that we cannot be expected to advance any new argument of importance on either ſide. Yet we may ſtate what has been urged both on the one and the other.

84 Arguments for private education.

They who have conſidered children as receiving their education in the houſe and under the eye of their parents, and as ſecluded in a great meaſure from the ſociety of other children, have been ſometimes led to conſider this ſituation as particularly favourable for their acquiring uſeful knowledge, and being formed to virtuous habits. Though we reap many advantages from mingling in ſocial life, yet in ſociety we are alſo tainted with many vices to which he who paſſes his life in ſolitary retirement is a ſtranger. At whatever period of life we begin to mix with the world, we ſtill find that we have not yet acquired ſufficient ſtrength to reſiſt thoſe temptations to vice with which we are there aſſailed. But if we are thus ready to be infected with the contagion of vice, even at any age, no other argument can be neceſſary to ſhow the propriety of confining children from thoſe dangerous ſcenes in which this infection is ſo eaſily caught. And whoever ſurveys the ſtate of morals in a public ſchool with careful and candid attention, even though it be under the management of the moſt virtuous, judicious, and aſſiduous teachers, will find reaſon to acknowledge, that the empire of vice is eſtabliſhed there not leſs fully than in the great world. Nothing, therefore, can be more negligent or inhuman, than for parents to expoſe their children to thoſe ſeductions which a great ſchool preſents, at a time when they are ſtrongly diſpoſed to imitate any example ſet before them, and have not yet learned to diſtinguiſh between ſuch examples as are worthy of imitation, and thoſe which ought to be beheld with abhorrence. Even when under the parent's eye, from intercourſe with ſervants and viſitors their native innocence is likely to ſuffer conſiderably. Yet the parent's care will be much more likely to preſerve the manners of his child uncorrupted in his own houſe, than any aſſiduity and watchfulneſs of his teachers in a ſchool.

The morals and diſpoſitions of a child ought to be the firſt objects of our concern in conducting his education: but to initiate him in the principles of uſeful knowledge is alſo an important object; and it will be happy, if in a private education virtue be not only better ſecured, but knowledge alſo more readily acquired, than in a public. But this actually happens. When one or two boys are committed to the care of a judicious tutor, he can watch the moſt favourable ſeaſons for communicating inſtruction; he can awake curioſity and command attention by the gentle arts of inſinuation: though he ſtrive not to inflame their breaſts with emulation, which leads often to envy and invetepupils. As his attention is not divided among a number, he can pay more regard to the particular diſpoſitions and turn of mind of each of his pupils: he can encourage him who is modeſt and ſlow, and repreſs the quickneſs and volatility of the other; and he can call forth and improve their powers, by leading them at one time to view the ſcenes of nature and the changes which ſhe ſucceſſively undergoes through the varying ſeaſons; at another, to attend to ſome of the moſt entertaining experiments of natural philoſophy; and again alluring them artfully to their literary exerciſes. With theſe he may mix ſome active games; and he may aſſume ſo much of the fondneſs of the parent, as to join in them with his little pupils. Theſe are certainly circumſtances favourable both to the happineſs and to the literary improvement of youth; but they are peculiar to a private education. Beſides, in a private education, as children ſpend more of their time with grown up people than in a public; thoſe, therefore, who receive a domeſtic education, ſooner acquire our manner of thinking, of expreſſing ourſelves, and of behaving, in our ordinary intercourſe with one another. For the very ſame reaſon for which girls are often obſerved to be capable of prudence and propriety of behaviour at an earlier age than boys, thoſe boys who receive a family education will begin ſooner to think and act like men, than thoſe who paſs their earlier days in a public ſeminary. And though you educate your ſon at home, there is no reaſon why he ſhould be more accuſtomed to domineer over his inferiors, or to indulge a capricious or inhumane diſpoſition, than if he were brought up among fifty boys, all of the ſame age, ſize, and rank, with himſelf. He may alſo, in a private education, exerciſe his limbs with the ſame activity as in a public one. He cannot, indeed, engage in thoſe ſports for which a party of companions is neceſſary; but ſtill there are a thouſand objects which will call forth his activity: if in the country, he will be diſpoſed to fiſh, to climb for bird-neſts, to imitate all that he ſees performed by labourers and mechanics: in ſhort, he will run, leap, throw and carry ſtones, and keenly exert himſelf in a variety of exerciſes, which will produce the moſt favourable effects on the powers both of his mind and body. It may indeed be poſſible for you to oppoſe the deſigns of nature ſo effectually, if you take pains for that purpoſe, as to repreſs the natural activity of your child or pupil, and cauſe him to pine away his time in liſtleſs indolence; but you will thus do violence to his diſpoſitions, as well as to thoſe inſtincts which nature has for wiſe purpoſes implanted in his breaſt. And the bad conſequences which may reſult from this management are not to be conſidered as the natural effects of a domeſtic education, but as the effects of an education careleſsly or imprudently conducted.

But there is another conſideration which will perhaps be ſtill more likely than any of thoſe which we have hitherto urged, to prevail with the fond parent to give his child a private education. As the infant who is abandoned by its mother to the care of an hireling nurſe, naturally transfers its affection from the unnatural parent to the perſon who ſupplies her room he ſtands to his father and mother, brothers or ſiſters, ſoon ceaſes to regard them with that fondneſs which he had contracted for them from living in their company and receiving their good offices. His reſpect, his affection, and his kindneſs, are beſtowed on new objects, perhaps on his maſter or his companions; or elſe his heart becomes ſelfiſh and deſtitute of every tender and generous feeling; and when the gentle and amiable affections of filial and fraternal love are thus, as it were, torn up by the roots, every evil paſſion ſprings up, with a rapid growth, to ſupply their place. The boy returns afterwards to his father's houſe: but he returns as a ſtranger; he is no longer capable of regarding his parents and relations with the ſame tenderneſs of affection. He is now a ſtranger to that filial love which ſprings up in the breaſt of the child who is conſtantly ſenſible of the tender care of his parents, and ſpends his earlier years under their roof, in ſuch a manner as to appear the effect of inſtinct rather than of habit. Selfiſh views are now the only bond which attaches him to his parents and relations; and by coming under their influence at ſo early a period of life, he is rendered for ever incapable of all the moſt amiable virtues which can adorn human nature. Let the parent, therefore, who loves his child, and wiſhes to obtain from him a mutual return of affection, beware of excluding him from his houſe, and devolving the ſole charge of him upon another, in his childhood.

Theſe views repreſent a private education as the moſt favourable to virtue, to knowledge, and to the mutual affection which ought always to unite the parent and his child. But let us now liſten to the arguments which are uſually urged in behalf of a public education.

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Arguments for public education.

In the firſt place, it has been aſſerted, that a public education is much more favourable than a private to the pupil's improvement in knowledge, and much more likely to inſpire him with an ardour for learning. In a private education, with whatever aſſiduity and tenderneſs you labour to render learning agreeable to your pupil, ſtill it will be but an irkſome taſk. You may confine him to his books but for a very ſhort ſpace in the courſe of the day, and allow him an alternation of ſtudy and recreation. Still, however, you will never be able to render his books the favourite objects of his attention. He will apply to them with reluctance and careleſs indifference: even while he ſeems engaged on his leſſon, his mind will be otherwiſe occupied; it will wander to the ſcenes where he purſues his diverſions, and to thoſe objects which have attracted his deſires. If the period during which you require his application be extremely ſhort; during the firſt part of it, he will ſtill be thinking of the amuſements from which you have called him, and regretting his confinement; during the laſt, he will fondly anticipate the moment when he is to be ſet at liberty, and think of new amuſements. Again, if you confine him during a longer period, ſtill more unfavourable effects will follow. Peeviſhneſs, dulneſs, and a determined averſion to all that bears the name of literature, will be naturally impreſſed on his mind by ſuch treatment. How can it be otherwiſe? Books poſſeſs ſo few of thoſe qualities which recommend any object to the attention of children, that they cannot be naturally agreeable. They have nothing to attract and detain the eye, the ear, or any of the ſenſes; they preſent things with which children are unacquainted, and of which they know not the value: children cannot look beyond the letters and words, to the things which theſe repreſent; and even though they could, yet is it much more pleaſing to view ſcenes and objects as they exiſt originally in nature, than to trace their images in a faint and imperfect repreſentation. It is vain, therefore, to hope that children will be prevailed with to pay attention to books by means of any allurements which books can of themſelves preſent. Other means muſt be uſed; but thoſe in a private education you cannot command. In a public ſeminary, the ſituation of maſters with reſpect to their pupils is widely different. When a number of boys meet together in the ſame ſchool, each of them ſoon begins to feel the impulſe of a principle which enables the maſter to command their attention without difficulty, and prompts them to apply with cheerful ardour to taſks which would otherwiſe be extremely irkſome. This principle is a generous emulation, which animates the breaſt with the deſire of ſuperior excellence, without inſpiring envy or hatred of a competitor. When children are prudently managed in a great ſchool, it is impoſſible for them not to feel its impulſe. It renders their taſks ſcarce leſs agreeable than their amuſements, and directs their activity and curioſity to proper objects. View the ſcholar at a public ſchool, compoſing his theme, or turning over his dictionary; how alert! how cheerful! how indefatigable! He applies with all the eagerneſs, and all the perſeverance, of a candidate for one of the moſt honourable places in the temple of fame. Again, behold and pity that poor youth who is confined to his chamber with no companion but his tutor; none whoſe ſuperiority can provoke his emulation, or whoſe inferiority might flatter him with thoughts of his own excellence, and thus move him to preſerve by induſtrious application the advantages which he has already gained. His book is before him; but how languid, how liſtleſs his poſture! how heavy and dull his eye! Nothing is expreſſed in his countenance but dejection or indignation. Examine him concerning his leſſon; he replies with confuſion and heſitation. After a few minutes obſervation, you cannot fail to be convinced that he has ſpent his time without making any progreſs in learning; that his ſpirits are now broken, his natural cheerfulneſs deſtroyed, and his breaſt armed with invincible prejudices againſt all application in the purſuit of literary knowledge. Beſides, in a ſchool there is ſomething more than emulation to render learning leſs diſagreeable than it naturally is to children. The ſlighteſt obſervation of life, or attention to our own conduct in various circumſtances, will be ſufficient to convince us, that whenever mankind are placed in circumſtances of diſtreſs, or ſubjected to any diſagreeable reſtraint, that which a ſingle perſon bears with impatience or dejection will make a much leſs impreſſion on his mind if a number of companions be joined with him in his ſuffering or reſtraint. It is eſteemed a piece of much greater ſeverity to confine a priſoner in a ſolitary cell, than when he is permitted to mix with others in the ſame uncomfortable ſituation. A journey appears much leſs tedious to a party of travellers, than to him who beats the path alone. In the ſame manner, when a number of boys in a great ſchool are all buſied on the ſame or on ſimilar taſks, a ſpirit of induſtry and perſeverance is communicated from one to another over the whole circle; each of them inſenſibly acquires new ardour and vigour; even though he feel not the ſpur of emulation, yet, while all are buſy around him, he cannot remain idle. Theſe are facts obvious to the moſt careleſs obſerver.

Neither are public ſchools ſo unfavourable to the virtue of their members as they have been repreſented to be. If the maſters are men of virtue and prudence, careful to ſet a good example before their pupils, attentive to the particular character and behaviour of each individual among them, firm to puniſh obſtinate and incorrigible depravity, and even to expel thoſe who are more likely to injure the morals of others than to be reclaimed themſelves, and at the ſame time eager to applaud and to encourage amiable and virtuous diſpoſitions wherever they appear; under the government of ſuch maſters, a public ſchool will not fail to be a ſchool of virtue. There will no doubt be particular individuals among the pupils of ſuch a ſeminary, whoſe morals may be corrupt and their diſpoſitions vicious; but this, in all probability, will ariſe from the manner in which they were managed before entering the ſchool, or from ſome other circumſtances, rather than from their being ſent for their education to a public ſchool. Again, at a public ſchool young people enjoy much greater advantages for preparing them to enter the world, than they can poſſibly be favoured with if brought up in a private and ſolitary manner. A great ſchool is a miniature repreſentation of the world at large. The objects which engage the attention of boys at a ſchool are different from thoſe which occupy their parents; the views of the boys are leſs extenſive, and they are not yet capable of proſecuting them by ſo many baſe and mean arts: but, in other reſpects, the two ſcenes and the actors upon them nearly reſemble each other; on both you behold contending paſſions, oppoſite intereſts, weakneſs, cunning, folly, and vice. He therefore who has performed his part on the miniature ſcene, has rehearſed as it were for the greater; if he has acquitted himſelf well on the one, he may be alſo expected to diſtinguiſh himſelf on the other; and even he who has not diſtinguiſhed himſelf at ſchool, at leaſt enters the world with ſuperior advantages when viewed in compariſon with him who has ſpent his earlier days in the ignorance and ſolitude of a private and domeſtic education. Beſides, when a number of boys meet at a public ſeminary of education, ſeparated from their parents and relations; nearly of the ſame age, engaged in the ſame ſtudies, and fond of the ſame amuſements; they naturally contract friendſhips with one another which are more cordial and ſincere than any that take place between perſons farther advanced in life. A friendſhip is often formed between two boys at ſchool which continues through life, and is productive of the happieſt conſequences to each of them. While at ſchool, they mutually aſſiſt and encourage each other in their learning; and their mutual affection renders their taſks leſs burdenſome perhaps they are mutually uſeful to each other by intereſt or by perſonal aſſiſtance in making their way in the world; or when they are engaged in the cares and buſtle of life, their intercourſe and correſpondence with each other may contribute much to conſole them amid the vexations and fatigues to which they may be expoſed.

Such are the chief arguments uſually adduced in favour of a public education. When we compare them with thoſe which have been urged to recommend a private education, we will perhaps find that each has its peculiar advantages. A public education is the more favourable to the acquiſition of knowledge, to vigour of mind, and to the formation of habits of induſtry and fortitude. A private education, when judiciouſly conducted, will not fail to be peculiarly favourable to innocence and to mildneſs of diſpoſition; and notwithſtanding what has ſometimes been advanced by the advocates for a public education, it is ſurely better to keep youth at a diſtance from the ſeductions of vice till they be ſufficiently armed againſt them, than to expoſe them to them at an

86 A medium between the two.

age when they know not to what dangers they lead, and are wholly unable to reſiſt them. Were we to give implicit credit to the ſpecious talk of the two parties, either a private or a public education would form characters more like to angels than to thoſe men whom we ordinarily meet in the world: but they ſpeak with the ardour of enthuſiaſts; and therefore we muſt liſten with caution both to the facts which they adduce, and to the inferences which they draw. Could we, without expoſing children to the contagion of a great town, procure for them the advantages of both a public and a private education at the ſame time, we would by this means probably ſucceed beſt in rendering them both reſpectable ſcholars and good men. If we may preſume to give our opinion freely, we would adviſe parents never, except when ſome unavoidable neceſſity of circumſtances obliges them, to expel their children from under their own roof till they be advanced beyond their boyiſh years: let the mother nurſe her own child; let her and the father join in ſuperintending its education: they may then expect to be rewarded, if they have acted their parts aright, by commanding the gratitude, the affection, and the reſpect of their child, whilſt he and they continue to live together. Let matters be ſo ordered, that the boy may reſide in his father's houſe, and at the ſame time attend a public ſchool: but let the girl be educated wholly under her mother's eye.

X. *On Travel.*

87 Travel conſidered in general.

Another queſtion which has been often diſcuſſed comes here under our review. The philoſophers of ancient Greece travelled in ſearch of knowledge. Books were then ſcarce, and thoſe few which were to be obtained were no very rich treaſuries of uſeful information. The rhapſodies of a poet, the rude legends of ſome ill-informed and fabulous hiſtorian, or the theories of fanciful philoſophers, were all that they could afford. Thales, Lycurgus, Solon, Plato, travelled, ſeeking that knowledge among more civilized who were the guardians of the traditions of antiquity, concerning the nature and origin of thoſe traditions; and obſerved the inſtitutions of thoſe nations which were moſt renowned for the wiſdom of their legiſlature. When they ſet out to viſit foreign countries, they ſeem to have propoſed to themſelves a certain end; and by keeping that end ſteadily in view during the courſe of their travels, they gained ſuch improvement as to be able on their return to command the veneration of their countrymen by means of the knowledge which they were enabled to communicate. Many beſides the philoſophers of ancient Greece have travelled for improvement, and have ſucceeded in their views. But ancient hiſtory does not relate to us, that travelling was conſidered by the Greeks or Romans as neceſſary to finiſh the education of their young men of fortune before they entered the ſcenes of active life. It is true, after Greece became a province of the Roman empire, and the Romans began to admire the ſcience and elegance of Greece, and to cultivate Grecian literature, the young noblemen of Rome often repaired to Rhodes and Athens to complete their ſtudies under the maſters of philoſophy and eloquence who taught in thoſe cities. But they went thither with the ſame views with which our youth in modern times are ſent to free ſchools and univerſities, not to acquire knowledge by the obſervation of nature, of the inſtitutions, manners, and cuſtoms of nations; but merely to hear lectures, read books, and perform exerciſes. In modern times, a few men of reflection and experience have now and then travelled for improvement: but the greateſt part of our travellers, for a long time, were enthuſiaſtic devotees who went in pilgrimage to viſit the ſhrine or relics of ſome favourite ſaint; ſoldiers, who wandered over the earth to deſtroy its inhabitants; or merchants, whoſe buſineſs as factors between widely diſtant countries and nations led them to brave every danger in traverſing from one corner of the globe to another. But ſince the nations of modern Europe have begun to emerge from rudeneſs, ignorance, and ſervile depreſſion, they have formed one great commonwealth, the members of which are ſcarce leſs intimately connected with each other than were the ſtates of ancient Greece. The conſequence of this mutual connection and dependence is, that almoſt all the nations of Europe have frequent intercourſe with one another; and as ſome of them are and have long been more enlightened and refined than others, thoſe nations who have attained the higheſt degrees of civilization and refinement have naturally attracted the admiration and homage of the reſt. Their language has been ſtudied, their manners and arts have been adopted, and even their dreſs has been imitated. Other nations have thronged to pay the homage due to their ſuperior merit, and to ſtudy under them as maſters. Hence has ariſen the practice which at preſent prevails among us of ſending our youth to complete their education by travelling, before we introduce them to active life, or require them to engage in buſineſs. Formerly young men were not ſent to travel till after they had proceeded through the forms of a regular education, and had at leaſt attained ſuch an age that they were no longer to be conſidered as mere boys. But the progreſs of luxury, the deſire of parents to introduce their children into the world at an early age that they may early attain to wealth and honours, and various other cauſes, have gradually introduced the practice of ſending mere boys to foreign countries, under pretence of affording them opportunities of ſhaking off prejudices, of ſtoring their minds with truly uſeful knowledge, and of acquiring thoſe graceful manners and that manly addreſs which will enable them to acquit themſelves in a becoming manner when they are called to the duties of active life. How much travelling at ſuch an early age contributes to fulfil the views of parents, a ſlight ſurvey of the ſenate-houſe, the gambling-houſes, the race-courſe, and the cock-pit, will readily convince the ſagacious obſerver.

But we wiſh to foſter no prejudices againſt neighbouring nations; we entertain no ſuch prejudices in favour of Britain, as to wiſh to confine our countrymen within the ſea-girt iſle. Let us inquire, what advantages may be gained by travelling, and at what age it may be moſt proper to ſet out in purſuit of thoſe advantages.

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Travel neceſſary to the acquiſition of knowledge.

After all that bookiſh men have urged, and notwithſtanding all that they may continue vehemently to urge, in behalf of the knowledge to be derived from their beloved books; it muſt ſtill be acknowledged, that books can teach us little more than merely the language of men. Or, if we ſhould grant that books are of higher importance, and that language is the leaſt valuable part of the knowledge which they teach, yet ſtill we need to beware that they lead us not aſtray; it is better to examine nature with the naked eye, than to view her through the ſpectacles of books. Neither the theories or experiments of philoſophers, nor the narratives of travellers, nor the relations of hiſtorians, though ſupported by a numerous train of authorities, are worthy of implicit credit. You retire from the world, confine yourſelf for years to your cloſet, and read volume after volume, hiſtorians, philoſophers, and poets; at laſt you fancy that you have gained an immenſe ſtore of knowledge: But leave your retirement, return into the world, compare the knowledge which you have treaſured up with the appearances of nature; you will find that you have laboured in vain, that it is only the ſemblance of knowledge which you have acquired, and will not ſerve for a faithful guide in life, nor even enable you to diſtinguiſh yourſelf for literary merit. Compare the relations of travellers with one another; how ſeldom do they agree when they deſcribe the ſame ſcenes and the ſame people! Turn your attention to the moſt reſpectable hiſtorians, compare their accounts of the ſame events; what diſagreement! what contrariety! Where ſhall truth be found? Liſten to the cool, the candid philoſophers; what contradictory theories do they build on the ſame ſyſtem of facts!

We agree, then, that it is better to ſeek knowledge by actual obſervation and experiment, than to receive it at ſecond-hand from the information of others. He who would gain an acquaintance with the beauties of external nature, muſt view them with his own eyes; he who would know the operations of the human underſtanding, muſt reflect upon what paſſes in his own mind; he who would know the cuſtoms, opinions, and manners of any people, muſt mingle with them, muſt obſerve their conduct, and liſten to their converſation. The arts are acquired by actual practice; the ſciences by actual obſervation in your own perſon, and by deducing inferences from your obſervations.

If therefore to extend our knowledge can contribute in any degree to render us happier, wiſer, or better; travelling, as being more favourable to knowledge than the ſtudy of books, muſt be highly advantageous. Get well acquainted with your own country; with the manners, the cuſtoms, the laws, and the political ſituation of your countrymen: Get alſo a knowledge of books; for books would not be altogether uſeleſs, though they could ſerve no other purpoſe but to teach us the language in which mankind expreſs themſelves: And then, if your judgment have attained maturity; if curioſity prompt you; if your conſtitution be robuſt and vigorous, and your ſpirits lively; you may imitate the Solons, Homers, and Platos of old, and viſit foreign countries in ſearch of knowledge, and with a view to bring home ſomething which may be of real utility to yourſelf and your country. You will, by this time, be ſo much maſter of the language of your own country, that you will not loſe it while you are learning the languages of foreign nations; your principles of taſte and of right and wrong will be ſo formed and fixed, that you will not deſpiſe any inſtitution or cuſtom or opinion merely becauſe it prevails not in your own country; nor yet will you be ready to admire and adopt any thing, merely becauſe it prevails among a foreign nation who are diſtinguiſhed for profound and extenſive knowledge, or for elegance of taſte and manners. No; you will diveſt yourſelf of every prejudice, and judge only by the fixed unalterable principles which determine the diſtinction between right and wrong between truth and falſehood, between beauty and deformity, ſublimity and meanneſs. Your object will not be to learn exotic vices, to mingle in frivolous amuſements, or to form a catalogue of inns. Your views, your inquiries, will have a very different direction. You will attend to the ſtate of the arts, of the ſciences, of morals, manners, and government; you will alſo contemplate with eager delight, the grand or beautiful ſcenes of nature, and examine the vegetable productions of the various regions through which you paſs, as well as the different tribes of animals which inhabit them; you will obſerve what bleſſings the beneficence of nature has conferred on the inhabitants of each particular diviſion of the globe, and how far the ingenuity and induſtry of man have taken advantage of the kindneſs of nature. Thus ſurveying the face of the earth, and conſidering how advantages and diſadvantages are balanced with each other through every various region and climate from one extremity of the globe to another; you will admire and revere that impartiality with which the Author of nature has diſtributed his benefits to the whole human race. When from the chilly climes and ſtubborn ſoil of the north, you turn your eyes to the fertile, genial regions of the ſouth, where every tree is loaded with exquiſite fruits, and every vegetable is nouriſhing and delicious; you will be pleaſed to find, that the inhabitants of the north, by their ſuperior ingenuity and vigour, are able to raiſe themſelves to circumſtances potiſm, and aſpiring to the ſweets of liberty as well as their Britiſh neighbours; you will be pleaſed to ſee, that the natural gaiety and cheerfulneſs of the former nation render them not incapable of the energy of the latter. You will be pleaſed to view the remains of antiquity, and the noble monuments of art; but you will think it below you to trifle away your time in gazing at palaces and churches, and collecting ruſty medals and fragments of marble; you will ſeek the ſociety of eminent men, and eagerly cultivate an acquaintance with the moſt diſtinguiſhed artiſts and men of ſcience who adorn the nations among whom you may happen to ſojourn: Knowing that the knowledge which is to be acquired in great towns, is by no means an adequate compenſation for the vicious habits which you are liable to contract in them; and beſides, that the luxuries, the arts, the manners, the virtues, and the vices of all great towns are nearly the ſame, ſo that when you have ſeen one, you have ſeen all others; you will avoid taking up your reſidence for any conſiderable time in any of the great towns through which you have occaſion to paſs in the courſe of your travels. The traveller who has attained the previous accompliſhments which we have mentioned as neceſſary, who ſets out with the views which we have ſuppoſed him to entertain, and who conducts his travels in this manner, cannot fail to return home enriched with much uſeful knowledge; he cannot but derive more real improvement from travelling, than he could have gained by ſpending the ſame period of time in ſolitary ſtudy: when he returns to his native country, he will appear among his countrymen as more than a philoſopher; a ſage, and a benefactor. His knowledge is ſo extenſive and accurate, his views are ſo liberal and enlarged, and he is ſo ſuperior to prejudices, without being the enemy of any uſeful eſtabliſhments, that he will be enabled to command univerſal eſteem, by performing his part in life with becoming dignity and propriety, and perhaps to render his name illuſtrious, and his memory dear to future times, by ſome important ſervices to the community to which he belongs, or even to mankind in general.

89 Circumſtances that render travelling unprofitable to the youth of the preſent age.

But though we have thus far, and we hope for obvious and ſolid reaſons, decided in favour of travelling, as being more likely than a ſolitary application to books, to furniſh the mind with uſeful and ornamental knowledge; yet we do not ſee that our Britiſh youth either take care to furniſh themſelves with the previous knowledge which we conſider as indiſpenſably neceſſary in order to prepare them for travelling with advantage, or ſet out with proper views, or proſecute their travels in a prudent, judicious manner. After receiving a very imperfect education, in which religious and moral inſtruction are almoſt wholly neglected, and no means are uſed to inſpire the youthful mind with ſolid, virtuous, manly qualities; but every art is tried to make the young man appear learned, while his mind is deſtitute of all uſeful information, and to teach him to aſſume the confidence of manhood before he has attained even to a moderate degree of ſenſe and prudence;—after an education conducted comfort to his parents and all his connections. He is hitherto unacquainted, perhaps, even with the ſimple events of the hiſtory of his native country; and either totally ignorant of claſſical literature, or but very ſuperficially inſtructed in it. He has not yet viewed with a diſcerning eye the manners and cuſtoms prevailing among his countrymen; he knows not the nature of the government under which he lives, nor the ſpirit of thoſe laws by which his civil conduct muſt be regulated. He has no fixed principles; no clear, diſtinct views. But to ſupply all his wants of this nature, he is put into the hands of a travelling governor, who is to be entirely ſubmiſſive to his will, and yet to ſerve him both for eyes and intellect. This governor is generally either ſome macaroni officer who is conſidered as well bred, and thought to know the world; or elſe, perhaps, ſome cringing ſon of literature, who having ſpent much time among his books, without acquiring ſuch ſtrength or dignity of mind as to raiſe him above frivolity of manners and converſation or pitiful fawning arts, is therefore regarded as happily qualified for this important charge. This reſpectable perſonage and his pupil are ſhipped off for France, that land of elegant diſſipation, frivolity, and faſhion. They travel on with eager impatience till they reach the capital. There the young man is induſtriouſly introduced to all the gay ſcenes which Paris can diſplay. He is, at firſt, confounded; by and by his ſenſes are faſcinated; new deſires are awaked in his breaſt; all around him he ſees the ſons of diſſipation wallowing in debauchery, or the children of vanity fluttering about like ſo many gawdy inſects. The poor youth has no fixed principles: he has not been taught to regard vanity as ridiculous, or to turn from vice with abhorrence. No attempt is made to allure him to thoſe objects, an attention to which can alone render travelling truly beneficial. Hitherto his mind had been left almoſt wholly uncultivated; and now, the ſeeds of vice are plentifully ſown in it. From one great town he is conveyed to another, till he viſit almoſt every place in Europe where profligacy of manners has attained to any uncommon height. In this happy courſe of education he probably continues to purſue improvement till he is well acquainted with moſt of the poſt-roads, the principal inns, and the great towns at leaſt in France and Italy; and perhaps till he has worn out his conſtitution, and rendered his mind totally incapable of any generous ſentiments or ſober reflection. He then reviſits his native country, to the inexpreſſible happineſs of his parents, who now eagerly long to embrace their all-accompliſhed child. But how miſerably are the poor folks diſappointed, when they find his conſtitution waſted, his underſtanding uninformed, his heart deſtitute of every manly or generous ſentiment; and perceive him to poſſeſs no accompliſhment, but ſuch as are merely ſuperficial? Perhaps, however, his parents are prevented by their partiality both for their child and for the means which they have adopted in conducting his education, from viewing his character and qualifications in a true light. Perhaps they overlook all his defects, or conſider them as ornaments, and regard their dear ſon as the mirror of perfection. But, unfortunately, though they be blind to the hideous deformity of the monſter which they have formed, they cannot hinder it from being conſpicuous to others; though they may view their ſon's character as amiable and reſpectable, they cannot render it uſeful, they cannot prevent it from being hurtful to ſociety. Let this youth whoſe education has been thus wiſely conducted, let him be placed at the head of an opulent fortune, advanced to a ſeat in the legiſlative body of his country, or called to act in any public character; how will he diſtinguiſh himſelf? As the virtuous patriot, the honeſt, yet able ſtateſman, the ſkilful general, or the learned, upright judge? How will he enjoy his fortune? Will he be the friend of the poor, the ſteady ſupporter of the laws and conſtitution under whoſe protection he lives? Will he ſhow himſelf capable of enjoying *otium cum dignitate?* If we reaſon by the uſual laws of probability, we cannot expect that he ſhould: and if we obſerve the manners and principles of our men of wealth and high birth who have been brought up in this manner, we find our reaſonings confirmed.

Such are the opinions which candid obſervation leads us to entertain with regard to the advantages which may be gained by travelling.

He whoſe mind has been judiciouſly cultivated, and who has attained to maturity of judgment, if he ſet out on his travels with a view to obtain real improvements, and perſiſt invariably in the proſecution of that view, cannot but derive very great advantage from travelling.

But again, thoſe young men whoſe minds have not been previouſly cultivated by a judicious education, who ſet out without a view to the acquiſition of real knowledge, and who wander among foreign nations, without attention to any thing but their luxuries, their follies, and their vices; thoſe poor young men cannot gain any real improvement from their travels.

Our countrymen, who travel for improvement, do not appear to derive ſo much advantage from their travels as were to be wiſhed, becauſe they generally receive too ſuperficial an education, ſet out at too early a period of life, and direct not their views to objects of real utility and importance.

XI. *On Knowledge of the World, and Entrance into Life.*

90
Unhappy effects of a too early introduction into the world

MUCH has been ſaid concerning the utility of a knowledge of the world, and the advantage of acquiring it at an early period of life. But thoſe who have the moſt earneſtly recommended this knowledge of the world, have generally explained themſelves in ſo inaccurate a manner concerning it, that it is difficult to underſtand what ideas they affix to it. They ſeem to wiſh, that, in order to acquire it, young people may be early made acquainted with all the vices and follies of the world, introduced into polite company, carried to public places, and not confined even from the gaming-table and the ſtews. Some knowledge of the world may, no doubt, be gained by theſe means. But it is ſurely dearly purchaſed; nor are the advantages which can be derived from it ſo conſiderable, as to tempt the judicious and affectionate parent to expoſe his child to the infection of vanity, folly, and vice, for their ſake. Carry a boy or girl into public life at the age of fourteen or fifteen; ſhow them all the ſcenes of ſplendid vanity and diſſipation which adorn London or Paris; tell them of the importance of dreſs, and of the ceremonies of good breeding and the forms of intercourſe; teach them that faſhionable indifference and aſſurance which give the *ton* to the manners of our fine gentlemen and fine ladies of the preſent age. What effects can you expect the ſcenes into which you introduce them, and the myſteries which you now teach them, to produce on the minds of the children? They have a direct tendency to inſpire them with a taſte for vanity, frivolity, and diſſipation. If you wiſh them to be like the fooliſh, the diſſipated, and the gay, you are likely to obtain your purpoſe; but if, on the contrary, your views are to prepare them for diſcharging the duties of life, you could not adopt more improper means: for though they be well acquainted with all thoſe things on which you place ſo much value, yet they have not thereby gained any acceſſion of uſeful knowledge. They are not now more able than before to eſtimate the real value of objects; nay, their judgement is now more liable than before to be miſled in eſtimating the value of the objects around them. Luxury, vanity, and faſhion, have ſtamped on many things an ideal value. By mingling at an early age in thoſe ſcenes of the world where luxury, vanity, and faſhion reign with arbitrary ſway, young people are naturally impreſſed with all thoſe prejudices which theſe have a tendency to inſpire. Inſtead of acquiring an uſeful knowledge of the world, they are rendered incapable of ever viewing the world with an unprejudiced and diſcerning eye. If poſſible, therefore, we ſhould rather labour to confine young people from mingling in the ſcenes of gay and diſſipated life till after they have attained maturity of age and judgment. They will then view them in a proper light, and perhaps be happy enough to eſcape the infectious contagion of vice.

91
What knowledge of the world may be ſafely communicated to young people.

But there is another and a more valuable knowledge of the world, which we ought induſtriouſly to communicate to them as ſoon as they are capable of receiving it. As ſoon as they are made thoroughly acquainted with the diſtinctions between right and wrong, between virtue and vice, between piety and impiety, and have become capable of entering into our reaſonings; we ought then to inform them concerning the various eſtabliſhments and inſtitutions which exiſt in ſociety; concerning the cuſtoms, opinions, and manners of mankind; and concerning the various degrees of ſtrength or weakneſs of mind, of ingenuity or dullneſs, of virtuous or vicious qualities, which diſcriminate thoſe characters which appear in ſociety. We ought alſo to ſeize every opportunity which may be preſented of exemplifying our leſſons by inſtances in real life. We muſt point out to them thoſe circumſtances which have led mankind to place an undue value on ſome objects, while they appretiate others much below their real utility and importance. Thus let us fortify their judgments againſt that impreſſion which the dazzling novelty of the ſcene, and the force of paſſion, will be apt to produce; and communicate to them a knowledge of the world, without expoſing them imprudently to the contagion of its vices and follies.

When at length the period arrives at which they and of thoſe principles which we have laboured to inculcate on their minds; let us warn them of the dangers to which they are about to be expoſed; tell them of the glory and the happineſs to which they may attain; inſpire them, if poſſible, with diſdain for folly, vanity, and vice, whatever dazzling or enchanting forms they may aſſume; and then diſmiſs them to enrich their minds with new ſtores of knowledge by viſiting foreign nations; or, if that ſhould be inconvenient, to enter immediately on the duties of ſome uſeful employment in active life.

EDULCORATION, properly ſignifies the rendering ſubſtances more mild. Chemical edulcoration conſiſts almoſt always in taking away acids and other ſaline ſubſtances; and this is effected by waſhing the bodies to which they adhere in a large quantity of water. The waſhing of diaphoretic antimony, powder of algaroth, &c. till the water comes off quite pure and inſipid, are inſtances of chemical edulcoration.—In pharmacy, juleps, potions, and other medicines, are ſaid to be *edulcorated*, by adding ſugar or ſyrup.

EDWARD, the name of ſeveral kings of England. See *(Hiſtory of)* ENGLAND.

EDWARDS (George), fellow of the royal and antiquarian ſocieties, was born at Stratford, a hamlet belonging to Weſtham in Eſſex, on the 3d of April 1694. After having ſpent ſome time at ſchool, he was put apprentice to a tradeſman in Fenchurch-ſtreet. His maſter, who was eminent both for his piety and ſkill in the languages, treated him with great kindneſs; but about the middle of his apprenticeſhip, an accident happened which totally put a ſtop to the hopes of young Edwards's advancing himſelf in the way of trade. Dr Nicolas, a perſon of eminence in the phyſical world, and a relation of his maſter's, happened to die. The Doctor's books were removed to an apartment occupied by Edwards, who eagerly employed all his leiſure-hours, both in the day and great part of the night, in peruſing thoſe which treated of natural hiſtory, ſculpture, painting, aſtronomy, and antiquities. The reading of theſe books entirely deprived him of any inclination for mercantile buſineſs he might have formerly had, and he reſolved to travel into foreign countries. In 1716, he viſited moſt of the principal towns in Holland, and in about a month returned to England. Two years after, he took a voyage to Norway, at the invitation of a gentleman who was diſpoſed to be his friend, and who was nephew to the maſter of the ſhip in which he embarked. At this time Charles XII. was beſieging Frederickſhall; by which means our young naturaliſt was hindered from making ſuch excurſions into the country as otherwiſe he would have done, for the Swedes were very careful to confine ſuch ſtrangers as could not give a good account of themſelves. But notwithſtanding all his precaution, he was confined by the Daniſh guard, who ſuppoſed him to be a ſpy employed by the enemy to get intelligence of their deſigns. However, by obtaining teſtimonials of his innocence, a releaſe was granted. In 1718 he returned to England, and next year viſited Paris by the way of Dieppe. During his ſtay in this country he made two journeys of 100 miles each; the firſt to Chalons in Champagne, in May 1720; the ſecond on foot, to Orleans and Blois: but an edict the banks of the Miſſiſſippi wanted population; our author narrowly eſcaped a weſtern voyage. On his arrival in England, Mr Edwards cloſely purſued his favourite ſtudy of natural hiſtory, applying himſelf to drawing and colouring ſuch animals as fell under his notice. A ſtrict attention to natural, more than pictureſque beauty, claimed his earlieſt care: birds firſt engaged his particular attention; and having purchaſed ſome of the beſt pictures of theſe ſubjects, he was induced to make a few drawings of his own; which were admired by the curious, who encouraged our young naturaliſt to proceed, by paying a good price for his early labours. Among his firſt patrons and benefactors may be mentioned James Theobalds, Eſq; of Lambeth; a gentleman zealous for the promotion of ſcience. Our artiſt, thus unexpectedly encouraged, increaſed in ſkill and aſſiduity; and procured, by his application to his favourite purſuit, a decent ſubſiſtence and a large acquaintance. However, he remitted his induſtry in 1731; when, in company with two of his relations, he made an excurſion to Holland and Brabant, where he collected ſeveral ſcarce books and prints, and had an opportunity of examining the original pictures of ſeveral great maſters at Antwerp, Bruſſels, Utrecht, and other cities. In December 1733, by the recommendation of the great Sir Hans Sloane, Bart. preſident of the college of phyſicians, he was choſen librarian, and had apartments in the college. This office was peculiarly agreeable to his taſte and inclination, as he had the opportunity of a conſtant recourſe to a valuable library, filled with ſcarce and curious books on the ſubjects of natural hiſtory, which he ſo aſſiduouſly ſtudied. By degrees he became one of the moſt eminent ornithologiſts in this or any other country. His merit is ſo well known in this reſpect, as to render any eulogium on his performances unneceſſary: but it may be obſerved, that he never truſted to others what he could perform himſelf; and often found it ſo difficult to give ſatisfaction to his own mind, that he frequently made three or four drawings to delineate the object in its moſt lively character, attitude, and repreſentation. In 1743, the firſt volume of the Hiſtory of Birds was publiſhed in quarto. His ſubſcribers exceeding even his moſt ſanguine expectations, a ſecond volume appeared in 1747. The third volume was publiſhed in 1750. In 1751, the fourth volume came from the preſs. This volume being the laſt he intended to publiſh at that time, he ſeems to have conſidered it as the moſt perfect of his productions in natural hiſtory; and therefore devoutly offered it up to the great God of nature, in humble gratitude for all the good things he had received from him in this world. Our author, in 1758, continued his labours under a new title, viz. *Gleanings of Natural Hiſtory*. A ſecond volume of the Gleanings was publiſhed in 1760. The third part, which made the ſeventh and laſt volume of his works, appeared in 1764. Thus our author, after a long ſeries of years, the moſt ſtudious application, and the moſt extenſive correſpondence to every quarter of the world, concluded a work which contains engravings and deſcriptions of more than 600 ſubjects in natural hiſtory, not before deſcribed or delineated. He likewiſe added a general index in French and Engliſh; which was afterwards perfected, with the Linnæan names, by that great naturaliſt Linnæus himſelf, who frequently honoured him with his friendſhip and correſpondence. Some time after Mr Edwards had been appointed library-keeper to the royal college of phyſicians, he was, on St Andrew's day, in the year 1750, preſented with an honorary compliment by the preſident and council of the royal ſociety, with the gold medal, the donation of Sir Godfrey Copley, Bart. annually given on that day to the author of any new diſcovery in art or nature, in conſideration of his natural hiſtory juſt then completed. A copy of this medal he had afterwards engraved, and placed under the title in the firſt volume of his hiſtory. He was a few years afterwards elected fellow of the royal ſociety, and of the ſociety of antiquaries, London; and alſo a member of many of the academies of ſciences and learning in different parts of Europe. In compliment to theſe honorary diſtinctions from ſuch learned bodies, he preſented elegant coloured copies of all his works, to the royal college of phyſicians, the royal ſociety, the ſociety of antiquarians, and to the Britiſh muſeum; alſo to the royal academy of ſciences at Paris, from whom he received the moſt polite and obliging letter of thanks by their then ſecretary Monſieur Defouchy. His collection of drawings, which amounted to upwards of 900, were purchaſed by the earl of Bute. They contain a great number of Britiſh as well as foreign birds, and other animals hitherto not accurately delineated or deſcribed. After the publication of the laſt work, being arrived at his 70th year, he found his ſight begin to fail, and his hand loſt its wonted ſteadineſs. He retired from public employment to a little houſe which he purchaſed at Plaiſtow; previous to which, he diſpoſed of all the copies, as well as plates, of his works. The converſation of a few ſelect friends, and the peruſal of a few ſelect books, were the amuſement of the evening of his life; and now and then he made an excurſion to ſome of the principal cities in England, particularly to Briſtol, Bath, Exeter, and Norwich. Some years before his death, the alarming depredations of a cancer, which baffled all the efforts of phyſical ſkill, deprived him of the ſight of one of his eyes: he alſo ſuffered much from the ſtone, a complaint to which at different periods of his life he had been ſubject. Yet it has been remarked, that, in the ſevereſt paroxyſms of miſery, he was ſcarcely known to utter a ſingle complaint. Having completed his 80th year, emaciated with age and ſickneſs, he died on the 23d of July 1773, deſervedly lamented by a numerous acquaintance.

EDYSTONE LIGHT-HOUSE, lying off Plymouth harbour, was firſt erected by the corporation of the Trinity-houſe in 1696; in conſideration of which, the maſters, &c. of Engliſh ſhipping agreed to pay one penny a ton outwards and inwards. It was demoliſhed by the ſtorm of 1703, and re-erected by act of parliament in the 4th of queen Anne, and the ſame duty on tonnage of ſhips granted for its ſupport; which law was enforced in the 8th of June. It has been ſince deſtroyed and rebuilt.

EECKHOUT (Gerbrant Vander), hiſtory and portrait painter, was born at Amſterdam in 1621, and was a diſciple of Rembrandt; whoſe manner of deſigning, colouring, and penciling, he imitated ſo nearly, that it is difficult to diſtinguiſh between ſeveral of his paintings and thoſe of his maſter. He painted after nature, and with ſuch a force as only nature can equal: his touch and his colouring are the ſame as Rembrandt's; but he rather excelled him in the extremities of his figures. His principal employment was for portraits; and in thoſe he was admirable: but he ſurpaſſed all his cotemporaries, in the power he had of painting the mind in the countenance. But although Eeckhout painted portraits to ſo great a degree of perfection, yet was he much more pleaſed to paint hiſtorical ſubjects, and he executed them with equal ſucceſs. In that ſtyle his compoſition is rich and full of judgment; the diſtribution of his maſſes of light and ſhadow is truly excellent; and in the opinion of many connoiſſeurs, he had more tranſparence in his colouring, and better expreſſion, than his maſter. He died in 1674.

EEL, in ichthyology, a ſpecies of MURÆNA.

Eel-Fiſhing. See BOBBING and SNIGGLING.

The ſilver-eel may be catched with ſeveral ſorts of baits, as powdered-beef, garden-worms, minnows, hens-guts, fiſh-garbage, &c. The moſt proper time for taking them is in the night, faſtening your line to the bank-ſides, with your laying-hook in the water: or a line may be thrown with good ſtore of hooks, baited and plumbed, with a float to diſcover where the line lies, that they may be taken up in the morning.

Microſcopic Eels. See ANIMALCULE, n° 8.

Eels in Vinegar, are ſimilar to thoſe in ſour paſte. The taſte of vinegar was formerly thought to be occaſioned by the biting of theſe little animals, but that opinion has been long ago exploded. Mentzelius ſays, he has obſerved the actual transformation of theſe little creatures into flies: but as this hath never been obſerved by any other perſon, nor is there an inſtance of ſuch a transformation in any other animalcule, it ſeems probable that Mentzelius hath been miſtaken in his obſervations.

Eel-Spear, a forked inſtrument with three or four jagged teeth, uſed for catching of eels: that with the four teeth is beſt, which they ſtrike into the mud at the bottom of the river, and if it ſtrike againſt any eels it never fails to bring them up.

EFFARE', or EFFRAYE', in heraldry, a term applied to a beaſt rearing on its hind-legs, as if it were frighted or provoked.

EFFECT, in a general ſenſe, is that which reſults from, or is produced by, any cauſe. See CAUSE.

EFFEMINATE, womaniſh, unmanly, voluptuous.

EFFEMINATE (*effeminati*), according to the vulgate, are mentioned in ſeveral places of ſcripture. The word is there uſed to ſignify ſuch as were conſecrated to ſome profane god, and proſtituted themſelves in honour of him. The Hebrew word *kadeſh*, tranſlated *effeminatus*, properly ſignifies *conſecrated*, and hence was attributed to thoſe of either ſex, who publicly proſtituted themſelves in honour of Baal and Aſtarte. Moſes expreſsly forbids theſe irregularities among the Iſraelites; but the hiſtory of the Jews ſhows, that they were notwithſtanding frequently practiſed. Levit. xxiii. 18.

EFFENDI, in the Turkiſh language, ſignifies *maſter*: and accordingly it is a title very extenſively applied; as, to the mufti and emirs, to the prieſts of moſques, to men of learning, and of the law. The grand chancellor of the empire is called *reis-effendi*.

EFFERVESCENCE, an inteſtine motion excited betwixt the parts of two bodies of different natures, when they reciprocally diſſolve each other. Effervescences are commonly attended with bubbles, vapours, ſmall jets of the liquid, and a hiſſing noiſe; and theſe phenomena are occaſioned by the air which at that time diſengages itſelf. Sometimes alſo they are accompanied with a great degree of heat, the cauſe of which is not ſo well known.

Formerly the word *fermentation*, was alſo applied to effervescences; but now that word is confined to the motion naturally excited in animal and vegetable matters, and from which new combinations among their principles take place.

EFFIGY, the portrait, figure, or exact repreſentation of a perſon.

Effigy, is alſo uſed for the print or impreſſion of a coin, repreſenting the prince's head who ſtruck it.

Effigy, to execute or degrade in, denotes the execution or degradation of a condemned contumacious criminal, who cannot be apprehended or ſeized. In France, they hang a picture on a gallows or gibbet, wherein is repreſented the criminal, with the quality or manner of the puniſhment: at the bottom is written the ſentence or condemnation. Such perſons as are ſentenced to death are executed in effigy.

EFFLORESCENCE, among phyſicians, the ſame with exanthema. See Exanthema.

Efflorescence, in chemiſtry, denotes the formation of a kind of mealy powder on the ſurface of certain bodies. Effloreſcence is occaſioned either by decompoſition or drying. The effloreſcence which happens to cobalt and martial pyrites is of the firſt; and that obſerved on the cryſtals of marine alkali, Glauber's ſalt, &c. of the latter kind. An effloreſcence is ſometimes alſo a ſpecies of cryſtallization, the nature of which is not well underſtood; as, the beautiful vegetations which ſhoot up from vitriolated tartar acidulated either with the vitriolic or nitrous acids, the ſaline ſpiculæ which are obſerved to ſhoot from ſalt butter, &c.

Beſides the common cryſtallization of ſalts, all of them have the property of appearing in the form of an effloreſcence, or ſmall ſaline ſpiculæ, when mixed with any thick ſubſtance, particularly lime. Whatever ſalt happens to be made uſe of, there is little or no difference in the effloreſcence. Thus, in butter very much ſalted, the ſea-ſalt ſhoots in the form of long ſpiculæ, though the ſea-ſalt itſelf never ſhoots but in the form of cubical cryſtals. In like manner, Glauber's ſalt will appear in the form of an effloreſcence, as well as the foſſile alkali, &c. nor will the form of the cryſtals of the effloreſcence be perceptibly different from thoſe of ſea-ſalt. The effloreſcences which we ſee very commonly upon walls are in general Glauber's ſalt. In ſome caſes (but ſeldom in ſuch effloreſcences as we have examined) they are compoſed of foſſile alkali. The reaſon of theſe differences is not known. In almoſt all caſes of this kind there ſeems to be a real growth of ſalt. On one ſpot of a plaſter wall about two feet ſquare, which we obſerved particularly, this growth was very evident. The produce was a true Glauber's ſalt; and by frequently taking off the effloreſcence, eight ounces were procured; nor did the prolific virtue of the wall ſeem to be in the leaſt impaired by the waſte.

EFFLORESCENTIA, in botany, (from *effloreſco* to bloom); the preciſe time of the year and month in which every plant ſhows its firſt flowers.

Some plants flower twice a-year, as is common between the tropics; others oftener, as the monthly roſe. The former are called by botaniſts *biferæ*; the latter, *multiferæ*.

The time of flowering is determined by the degree of heat which each ſpecies requires. Mezereon and ſnowdrop produce their flowers in February; primroſe, in the beginning of March; the greater number of plants, during the month of May; corn, and other grain, in the beginning of June; the vine, in the middle of the ſame month; ſeveral compound flowers, in the months of July and Auguſt; laſtly, meadow-ſaffron flowers in the month of October, and announces the ſpeedy approach of winter.

Graſs of Parnaſſus always flowers about the time of cutting down the hay; and in Sweden, the different ſpecies of thiſtle, mountain-lettuce, ſuccory, and balſam, ſeldom flower till after the ſummer ſolſtice: the country-men even know, as by a kalendar, that the ſolſtice is paſt when theſe plants begin to produce their flowers.

The temperature of the ſeaſons has a mighty influence both in accelerating and retarding the flowering of plants. All plants are earlier in warm countries: hence ſuch as are cultivated out of their native ſoil, never flower till the heat of the climate, or ſituation into which they are removed, is equal to that under the influence of which they produced flowers in their own country. For this reaſon, all exotics from warm climates are later in this country than many plants which it naturally produces.

In general, we may obſerve, that the plants of the coldeſt countries, and thoſe produced on the mountains in all climates, being of equal temperature, flower about the ſame time, viz. during our ſpring in Europe.

Plants that grow betwixt the tropics, and thoſe of temperate climates, flower during our ſummer.

Plants of temperate climates, ſituated under the ſame parallel of latitude with certain parts of Europe, but removed much farther to the weſt, ſuch as Canada, Virginia, and Miſſiſſippi, do not produce flowers till autumn.

Plants of temperate climates in the oppoſite hemiſphere to Europe, flower during our winter, which is the ſummer of theſe regions.

Linnæus and Adanſon have given a ſketch of the different times in which plants flower at Upſal and Paris.

EFFLUVIUM, in phyſiology, a term much uſed by philoſophers and phyſicians, to expreſs the minute particles which exhale from moſt, if not all, terreſtrial bodies, in form of inſenſible vapours.

EFFRONTES, in church-hiſtory, a ſect of heretics, in 1534, who ſcraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony ſerved them inſtead of baptiſm. They are likewiſe ſaid to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with ſome degree of force. In the ancient heathen ſacrifices

crifices there were divers effuſions of wine and other liquors, called *libations*.

Effusion, or Fusion, in aſtronomy, denotes that part of the ſign Aquarius, repreſented on celeſtial globes and planiſpheres, by the water iſſuing out of the urn of the water-bearer.

EFT, in zoology, the Engliſh name of the common lizard. See Lacerta.

EGERIA, or Ægeria, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and according to Ovid, ſhe became his wife. This prince frequently viſited her; and that he might introduce his laws and new regulations into the ſtate, he ſolemnly declared before the Roman people, that they were previouſly ſanctified and approved by the nymph Egeria. Ovid ſays, that Egeria was ſo diſconſolate at the death of Numa, that ſhe melted into tears, and was changed into a fountain by Diana. She is reckoned by many as a goddeſs who preſided over the pregnancy of women; and ſome maintain that ſhe is the ſame as Lucina.

EGG, in phyſiology, a body formed in certain females, in which is contained an embryo or fetus of the ſame ſpecies, under a cortical ſurface or ſhell. The exterior part of an egg is the ſhell; which in a hen, for inſtance, is a white, thin, and friable cortex, including all the other parts. The ſhell becomes more brittle by being expoſed to a dry heat. It is lined every where with a very thin but a pretty tough membrane, which dividing at, or very near, the obtuſe end of the egg, forms a ſmall bag, where only air is contained. In new-laid eggs this follicle appears very little, but becomes larger when the egg is kept.

Within this are contained the albumen or white, and the vitellus or yolk; each of which have their different virtues.

The albumen is a cold, viſcous, white liquor in the egg, different in conſiſtence in its different parts. It is obſerved, that there are two diſtinct albumens, each of which is incloſed in its proper membrane. Of theſe one is very thin and liquid: the other is more denſe and viſcous, and of a ſomewhat whiter colour; but, in old and ſtale eggs, after ſome days incubation, inclining to a yellow. As this ſecond albumen covers the yolk on all ſides, ſo it is itſelf ſurrounded by the other external liquid. The albumen of a fecundated egg, is as ſweet and free from corruption, during all the time of incubation, as it is in new-laid eggs; as is alſo the vitellus. As the eggs of hens conſiſt of two liquors ſeparated one from another, and diſtinguiſhed by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; ſo it is very probable that they are of different natures, and conſequently appointed for different purpoſes.

When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more ſpace. For as the fetus increaſes, the albumen inſenſibly waſtes away and condenſes: the vitellus, on the contrary, ſeems to loſe little or nothing of its bulk when the fetus is perfected, and only appears more liquid and humid when the abdomen of the fetus begins to be formed.

The chick in the egg is firſt nouriſhed by the albumen; and when this is conſumed, by the vitellus, as with milk. If we compare the chalazæ to the extremities of an axis paſſing through the vitellus, which is of a ſpherical form, this ſphere will be compoſed of two unequal portions, its axis not paſſing through its centre; conſequently, ſince it is heavier than the white, its ſmaller portion muſt always be uppermoſt in all poſitions of the egg.

The yellowiſh white round ſpot, called *cicatricula*, is placed on the middle of the ſmaller portion of the yolk; and therefore, from what has been ſaid in the laſt paragraph, muſt always appear on the ſuperior part of the vitellus.

Not long before the excluſion of the chick, the whole yolk is taken into its abdomen; and the ſhell, at the obtuſe end of the egg, frequently appears cracked ſome time before the excluſion of the chick. The chick is ſometimes obſerved to perforate the ſhell with its beak. After excluſion, the yolk is gradually waſted, being conveyed into the ſmall-guts by a ſmall duct.

Eggs differ very much according to the birds that lay them, as to their colour, form, bigneſs, age, and the different way of dreſſing them: thoſe moſt uſed in food are hens eggs; of which, ſuch as are new-laid are beſt.

As to the preſervation of eggs, it is obſerved that the egg is always quite full when it is firſt laid by the hen; but from that time it gradually becomes leſs and leſs ſo, to its decay: and however compact and cloſe its ſhell may appear, it is nevertheleſs perforated with a multitude of ſmall holes, though too minute for the diſcernment of our eyes, the effect of which is a daily decreaſe of matter within the egg, from the time of its being laid; and the preſpiration is much quicker in hot weather than in cold.

To preſerve the egg freſh, there needs no more than to preſerve it full, and ſtop its tranſpiration; the method of doing which is, by ſtopping up thoſe pores with matter which is not ſoluble in watery fluids: and on this principle it is, that all kinds of varniſh, prepared with ſpirit of wine, will preſerve eggs freſh for a long time, if they are carefully rubbed all over the ſhell: tallow, or mutton fat, is alſo good for this purpoſe; for ſuch as are rubbed over with this, will keep as long as thoſe coated over with varniſh.

Artificial Method of Hatching Eggs. See Hatching.

EGINA. See Ægina.

EGINHART, ſecretary to the emperor Charles the Great, was a German. He is the moſt ancient hiſtorian of that nation, and wrote very eloquently for a man of the 9th century. It is ſaid, that he inſinuated himſelf ſo well into the favour of Imma, daughter to Charles the Great, that he obtained from her whatever he deſired. Charles the Great, having found out the intrigue, did not do as Auguſtus, who is thought to have baniſhed Ovid becauſe he believed him to be too much favoured by Julia; for he married the two lovers together, and gave them a fine eſtate in land.

EGLANTINE, in botany. See Rosa.

EGLON, a king of the Moabites, who oppreſſed the Iſraelites for 18 years (Judges iii. 12—14.) Calmet confounds this ſervitude of the Hebrews with that under Chuſan-ruſhathaim, making it to ſubſiſt only eight years, from the year of the world 2591 to 2599;

whereas this ſervitude under Eglon laſted 18 years, and commenced in the year of the world 2661, and 62 years after they had been delivered by Othniel from the ſubjection of Chuſhan-ruſhathaim.

EGRA, a town of Bohemia, formerly imperial, but now ſubject to the houſe of Auſtria. It contains a great number of able artificers, and is famous for its mineral waters. Wallenſtein, the emperor's general, was aſſaſſinated here in 1634. The French became maſters of this town in 1741; but afterwards being blocked up, they were forced to capitulate on September 7th, 1743. It is looked upon as a town of the greateſt conſequence in Bohemia, except Prague. It is ſeated on a river of the ſame name, in E. Long. 12. 30. N. Lat. 50. 21.

EGRET, in ornithology, a ſpecies of ardea. See Ardea.

EGYPT, an extenſive country of Africa, lying between 30° and 36° of eaſt longitude, and between 21° and 31° of north latitude. It is bounded by the Mediterranean on the north; by the Red-ſea and Iſthmus of Suez, which divide it from Arabia, on the eaſt; by Abyſſinia or Ethiopia, on the ſouth; and by the deſarts of Barca and Nubia, on the weſt; being 600 miles in length from north to ſouth, and from 100 to 200 in breadth from eaſt to weſt.

1
Different names.

As a nation, the Egyptians may with juſtice lay claim to as high antiquity as any in the world. The country was moſt probably peopled by Mizraim the ſon of Ham and grandſon of Noah.—By its ancient inhabitants it was called *Chemiā*, and is ſtill called *Chemi* in the language of the *Copts* or native Egyptians; and this name it is ſuppoſed to have received from Ham the ſon of Noah. In ſcripture, we find it moſt generally named *Mizraim;* though in the Pſalms it is ſtyled the *land of Ham.*—To us it is beſt known by the name *Egypt*, the etymology of which is more uncertain.—Some derive it from *Ægyptus*, a ſuppoſed king of the country: others ſay it ſignifies no more than "the land of the *Copts;*" *Aia* in Greek ſignifying a country, and *Æcoptos* being eaſily ſoftened into *Ægyptus.*—The moſt probable opinion, however, ſeems to be, that it received this name from the blackneſs of its ſoil, and the dark colour both of its river and inhabitants: for ſuch a blackiſh colour is by the Greeks called *ægyptios* from *gyps*, and *ægyps* "a vulture;" and by the Latins, *ſubvulturius.* For the ſame reaſon, other names of a ſimilar import have been given to this country by the Greeks; ſuch as *Aeria*, and *Melambolus:* the river itſelf was called *Melo* or *Melas;* by the Hebrews, *Shibor;* and by the Ethiopians, *Siris;* all of which ſignify "black."

Ancient Egypt is by ſome divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly ſo called, or *Thebais;* the Middle Egypt, or *Heptanomis;* and the Lower Egypt, the beſt part of which was the *Delta*, or that ſpace encompaſſed by the branches of the Nile. See Thebais, &c.

The Egyptians, like the Chineſe, pretend to an exceſſive antiquity, pretending to have records for ten, twenty, or even fifty thouſand years. Thus their hiſtory is ſo much involved in obſcurity and fable, that for many ages it muſt be paſſed over in ſilence.—The firſt mortal king whom the Egyptians own to have reigned in that country, was *Menes* or *Menas.* At what time he reigned, it would be to very little purpoſe to inquire. He had been preceded, however, by a ſet of immortals, who it ſeems left him the kingdom in a very bad ſituation: for the whole country, except Thebais, was a moraſs; the people alſo were entirely deſtitute of religion, and every kind of knowledge which could render their life comfortable and happy. Menes diverted the courſe of the Nile, which before that time had waſhed the foot of a ſandy mountain near the borders of Libya, built the city of Memphis, inſtructed his ſubjects, and did other things of a ſimilar kind which are uſually attributed to the founders of kingdoms.

2
Invaded by the ſhepherds.

From the time of Menes, the Egyptian chronology is filled with a liſt of 330 kings, who reigned 1400 years, but did nothing worthy of notice.—The firſt diſtinct piece of hiſtory we find concerning Egypt, is the irruption of the *Shepherds*, by whom the country was ſubdued; but whether this revolution happened during the vaſt interval of indolence above mentioned, or before or after, cannot be known. The affair is thus related by Manetho. It happened, in the reign of Timaus king of Egypt, that God being diſpleaſed with the Egyptians, they ſuffered a great revolution: for a multitude of men, ignoble in their race, took courage, and, pouring from the eaſt into Egypt, made war with the inhabitants; who ſubmitted to them without reſiſtance. The ſhepherds, however, behaved with the greateſt cruelty; burnt the cities, threw down the temples of the gods, and put to death the inhabitants, carrying the women and children into captivity. This people came from Arabia, and were called *Hycſos*, or *king-ſhepherds.* They held Egypt in ſubjection for 259 years; at the end of which period, they were obliged by a king of Upper Egypt, named *Aonoſis*, or *Thethmoſis*, to leave the country. This prince's father had, it ſeems, gained great advantages over them, and ſhut them up in a place called *Abaris*, or *Avaris*, containing 10,000 acres of land. Here they were cloſely beſieged by Amoſis, with an army of 400,000 men; but at laſt the king, finding himſelf unable to reduce them by force, propoſed an agreement, which was readily accepted. In conſequence of this agreement, the ſhepherds withdrew from Egypt with their families, to the number of 240,000; and, taking the way of the deſart, entered Syria: but fearing the Aſſyrians, who were then very powerful, and maſters of Aſia, they entered the land of Judæa, and built there a city capable of holding ſo great a multitude, and called it *Jeruſalem.*

According to Mr Bruce, the ſhepherds who invaded Egypt were no other than the inhabitants of Barbary. They were, he ſays, *carriers* to the Cuſhites who lived farther to the ſouth. The latter had built the many ſtately temples in Thebes and other cities of Egypt; though, according to him, they had no dwelling-places but holes or caves in the rocks. Being a commercial people, they remained at home collecting and preparing their articles, which were diſperſed by the *barabers* or ſhepherds already mentioned. Theſe, from the nature of their employment, lived in moveable habitations, as the Tartars do at this day. By the Hebrews, he tells us, they were called *phut*, but *ſhepherds* by every other people; and from the name *baraber*, the word *Barbary* is derived. By their employment, which was the diſperſing the Arabian and African goods all over the continent, they had become a great and powerful people; and from their oppoſite diſpoſitions and manners, became very frequently enemies to the Egyptians. To one Salatis our author aſcribes the deſtruction of Thebes in Upper Egypt, ſo much celebrated by Homer for its magnificence. But this certainly cannot be the caſe; for Homer wrote long after the time of Joſeph: and we find that even then the Egyptians had the ſhepherds in abhorrence, in all probability becauſe they had been grievouſly oppreſſed by them. Mr Bruce counts three invaſions of theſe people; the firſt, that of Salatis already mentioned, who overthrew the firſt dynaſty of Egyptian kings from Menes, and deſtroyed Thebes: the ſecond was that of Sabacco or *So;* for according to him this was not the name of a ſingle prince, but of a people, and ſignifies *ſhepherds:* and the third, after the building of Memphis, where 240,000 of them were beſieged as above mentioned. But accounts of this kind are evidently inconſiſtent in the higheſt degree; for how is it poſſible that the *third* invaſion, antecedent to the building of Jeruſalem, could be poſterior to the *ſecond*, if the latter happened only in the days of Hezekiah?

In theſe early ages, however, it would ſeem that the kingdom of Egypt had been very powerful and its dominion very widely extended; ſince we find it ſaid, that the *Bactrians* revolted from Oſymandyas, another Egyptian king of very high antiquity, and of whoſe wealth the moſt marvellous accounts are given.

After an unknown interval of time from this monarch, reigned Seſoſtris. He was the firſt great warrior whoſe conqueſts are recorded with any degree of diſtinctneſs. In what age of the world he lived, is uncertain. Some chronologers, among whom is Sir Iſaac Newton, are of opinion, that he is the Seſac or Shiſhak, who took Jeruſalem in the reign of Rehoboam the ſon of Solomon. Others, however, place him much earlier; and Mr Whiſton will have him to be the Pharaoh who refuſed to part with the Iſraelites, and was at laſt drowned in the Red Sea. Mr Bryant endeavours to prove that no ſuch perſon ever exiſted; but that in his hiſtory, as well as that of many ancient heroes, we have an abridgement of that of the Cuſhites or Babylonians, who ſpread themſelves over great part of the known world, and every where brought the people in ſubjection to them. His reign is reckoned the moſt extraordinary part of the Egyptian hiſtory; and the following ſeems to be the leaſt fabulous account that can be got of it. The father of Seſoſtris was told in a dream, by the god Vulcan, that his ſon, who was then newly born, or perhaps ſtill unborn, ſhould be lord of the whole earth. His father, upon the credit of this viſion, got together all the males in the land of Egypt that were born on the ſame day with Seſoſtris; appointed nurſes and proper perſons to take care of them, and had them treated like his own child; being perſuaded that they who had been the conſtant companions of his youth would prove the moſt faithful miniſters and ſoldiers. As they grew up, they were inured to laborious exerciſes; and, in particular, were never permitted to taſte any food till they had performed a courſe of 180 furlongs, upwards of 22 of our miles. When the old king imagined they were ſufficiently educated in the martial way he deſigned them to follow, they were ſent by way of trial of their abilities againſt the Arabians. In this expedition Seſoſtris proved ſucceſsful, and in the end ſubdued that people who had never before been conquered. He was ſent to the weſtward, and conquered the greateſt part of Africa; nor could he be ſtopped in his career till he arrived at the Atlantic ocean. Whilſt he was on this expedition, his father died; and then Seſoſtris reſolved to fulfil the prediction of Vulcan, by actually conquering the whole world. As he knew that this muſt take up a long time, he prepared for his journey in the beſt manner poſſible. The kingdom he divided into 36 provinces, and endeavoured to ſecure the affections of the people by gifts both of money and land. He forgave all who had been guilty of offences, and diſcharged the debts of all his ſoldiers. He then conſtituted his brother Arais the ſupreme regent; but forbad him to uſe the diadem, and commanded him to offer no injury to the queen or her children, and to abſtain from the royal concubines. His army conſiſted of 600,000 foot, 24,000 horſe, and 27,000 chariots. Beſides theſe land-forces, he had at ſea two mighty fleets; one, according to Diodorus, of 400 ſail. Of theſe fleets, one was deſigned to make conqueſts in the weſt, and the other in the eaſt; and therefore the one was built on the Mediterranean and the other on the Red Sea. The firſt of theſe conquered Cyprus, the coaſt of Phœnicia, and ſeveral of the iſlands called *Cyclades:* the other conquered all the coaſts of the Red Sea; but its progreſs was ſtopped by ſhoals and difficult places which the navigators could not paſs, ſo that he ſeems not to have made many conqueſts by ſea.

With the land-forces Seſoſtris marched againſt the Ethiopians and Troglodites; whom he overcame, and obliged them to pay him a tribute of gold, ebony, and ivory. From thence he proceeded as far as the promontory of Dira, which lay near the ſtraits of Babelmandel, where he ſet up a pillar with an inſcription in ſacred characters. He then marched on to the country where cinnamon grows, or at leaſt to ſome country where cinnamon at that time was brought, probably ſome place in India; and here he in like manner ſet up pillars, which were to be ſeen for many ages after. As to his farther conqueſts, it is agreed by almoſt all authors of antiquity, that he over-ran and pillaged the whole continent of Aſia, and ſome part of Europe. He croſſed the Ganges, and erected pillars on its banks; and from thence he is ſaid to have marched eaſtward to the very extremity of the Aſiatic continent. Returning from thence, he invaded the Scythians and Thracians; but all authors do not agree that he conquered them. Some even affirm, that he was overthrown by them with great ſlaughter, and obliged to abandon a great part of his booty and military ſtores. But whether he had good or bad ſucceſs in theſe parts, it is a common opinion that he ſettled a colony in Colchis. Herodotus, however, who gives the moſt particular account of the conqueſts of this monarch, does not ſay whether the colony was deſignedly planted by Seſoſtris; or whether part of his army loitered behind the reſt, and took up their reſidence in that region. From his own knowledge, he aſſerts, that the inhabitants of that country were undoubtedly of Egyptian deſcent. This was evident from the perſonal reſemblance they bore to the Egyptians,

tians, who were ſwarthy-complexioned and frizzle-haired; but more eſpecially from the conformity of their cuſtoms, particularly circumciſion.

The utmoſt boundary of this mighty monarch's conqueſts, however, was in the country of Thrace; for beyond this country his pillars were no where to be ſeen. Theſe pillars he was accuſtomed to ſet up in every country which he conquered, with the following inſcription, or one to the ſame purpoſe: "Seſoſtris, king of kings, and lord of lords, ſubdued this country by the power of his arms." Beſides theſe, he left alſo ſtatues of himſelf; two of which, according to Herodotus, were to be ſeen in his time; the one on the road between Epheſus and Phocæa, and the other between Smyrna and Sardis: they were armed after the Ethiopian and Egyptian manner, holding a javelin in one hand and a bow in the other. Acroſs the breaſt they had a line drawn from one ſhoulder to the other, with the following inſcription; "This region I obtained by theſe my ſhoulders." They were miſtaken for images of Memnon.

3
Returns to Egypt.

The reaſons given by Seſoſtris for his returning into Egypt from Thrace, and thus leaving the conqueſt of the world unfiniſhed, were the want of proviſions for his army, and the difficulty of the paſſes. Moſt probably, however, his return was haſtened by the intelligence he received from the high prieſt of Egypt, concerning the rebellious proceedings of his brother; who, encouraged by his long abſence, had aſſumed the diadem, violated the queen, and alſo the royal concubines. On receiving this news, Seſoſtris haſtened from Thrace; and at the end of nine years came to Peluſium in Egypt, attended by an innumerable multitude of captives taken from many different nations, and loaded with the ſpoils of Aſia. The treacherous brother met him at this city; and it is ſaid, with very little probability, that Seſoſtris accepted of an invitation to an entertainment from him. At this he drank freely, together with the queen and the reſt of the royal family. During the continuance of the entertainment, Armais cauſed a great quantity of dried reeds to be laid round the apartment where they were to ſleep; and as ſoon as they were retired to reſt ſet fire to the reeds. Seſoſtris perceiving the danger he was in, and that his guards, overcharged with liquor, were incapable of aſſiſting him, ruſhed through the flames, and was followed by his wife and children. In thankſgiving for this wonderful deliverance, he made ſeveral donations to the gods, particularly to Vulcan the god of fire. He then took vengeance on his brother Armais, ſaid to be the Danaus of the Greeks, who, being on this occaſion driven out of Egypt, withdrew into Greece.

4
His great works.

Seſoſtris now laid aſide all thoughts of war, and applied himſelf wholly to ſuch works as might tend to the public good, and his own future reputation. In order to prevent the incurſions of the Syrians and Arabians, he fortified the eaſt ſide of Egypt with a wall which ran from Peluſium through the deſert to Heliopolis, for 187½ miles. He raiſed alſo an incredible number of vaſt and lofty mounts of earth, to which he removed ſuch towns as had before been ſituated too low, in order to ſecure them from the inundations of the Nile. All the way from Memphis to the ſea he dug canals which branched out from the Nile; and not only made an eaſier communication between different places, but rendered the country in a great meaſure impaſſable to any enemy. He erected a temple in every city in Egypt, and dedicated it to the ſupreme deity of the place; but in the courſe of ſuch a great undertaking as this neceſſarily muſt have been, he took care not to employ any of his Egyptian ſubjects. Thus he ſecured their affection, and employed the vaſt multitude of captives he had brought along with him; and to perpetuate the memory of a tranſaction ſo remarkable, he cauſed to be inſcribed on all theſe temples, "No one native laboured hereon." In the city of Memphis, before the temple of Vulcan, he raiſed ſix gigantic ſtatues, each of one ſtone. Two of them were 30 cubits high, repreſenting himſelf and his wife; the other four were 20 cubits each, and repreſented his four ſons. Theſe he dedicated to Vulcan in memory of his above mentioned deliverance. He raiſed alſo two obeliſks of marble 120 cubits high, and charged them with inſcriptions, denoting the greatneſs of his power, his revenues, &c.

The captives taken by Seſoſtris are ſaid to have been treated with the greateſt barbarity; ſo that at laſt they reſolved at all events to deliver themſelves from a ſervitude ſo intolerable. The Babylonians particularly were concerned in this revolt, and laid waſte the country to ſome extent; but being offered a pardon and a place to dwell in, they were pacified, and built for themſelves a city which they called *Babylon*. Towards the conquered princes who waited on him with their tribute, the Egyptian monarch behaved with unparalleled inſolence. On certain occaſions he is ſaid to have unharneſſed his horſes, and, yoking kings together, made them draw his chariot. One day, however, obſerving one of the kings who drew his chariot to look back upon the wheels with great earneſtneſs, he aſked what made him look ſo attentively at them? The unhappy prince replied, "O king, the going round of the wheel puts me in mind of the viciſſitudes of fortune: for as every part of the wheel is uppermoſt and lowermoſt by turns, ſo it is with men; who one day ſit on a throne, and on the next are reduced to the vileſt degree of ſlavery." This anſwer brought the inſulting conqueror to his ſenſes; ſo that he gave over the practice, and thenceforth treated his captives with great humanity. At length this mighty monarch loſt his ſight, and laid violent hands on himſelf.

5
His death.

After the death of Seſoſtris, we meet with another chaſm of an indeterminate length in the Egyptian hiſtory. It concludes with the reign of Amaſis or Ammoſis; who being a tyrant, his ſubjects joined Actiſanes the king of Ethiopia to drive him out.—Thus Actiſanes became maſter of the kingdom; and after his death follows another chaſm in the hiſtory, during which the empire is ſaid to have been in a ſtate of anarchy for five generations.—This period brings us down to the times of the Trojan war. The reigning prince in Egypt was at that time called *Cetes*; by the Greeks, *Proteus*. The prieſts reported that he was a magician; and that he could aſſume any ſhape he pleaſed, even that of fire. This fable, as told by the Greeks, drew its origin from a cuſtom among the Egyptians, perhaps introduced by Proteus. They were uſed to adorn and diſtinguiſh the heads of their kings with the repreſentations of animals or vegetables, or

6
Origin of the fable of Proteus.

even with burning incenſe, in order to ſtrike the beholders with the greater awe.

7 Arrival of Paris and Helen in Egypt.

Whilſt Proteus reigned, Paris or Alexander, the ſon of Priam king of Troy, was driven by a ſtorm on the coaſt of Egypt, with Helen, whom he was carrying off from her huſband. But when the Eygptian monarch heard of the breach of hoſpitality committed by Paris, he ſeized him, his miſtreſs, and companions, with all the riches he had brought away with him from Greece. He detained Helen, with all the effects belonging to Menelaus her huſband, promiſing to reſtore them to the injured party whenever they were demanded; but commanded Paris and his companions to depart out of his dominion in three days, on pain of being treated as enemies. In what manner Paris afterwards prevailed upon Proteus to reſtore his miſtreſs, we are not told; neither do we know any thing further of the tranſactions of this prince's reign nor of his ſucceſſors, except what has entirely the air of fable, till the days of Sabbaco the Ethiopian, who again conquered this kingdom.

8 Egypt conquered by Sabbaco.

He began his reign with an act of great cruelty, cauſing the conquered prince to be burnt alive: nevertheleſs, he no ſooner ſaw himſelf firmly eſtabliſhed on the throne of Egypt, than he became a new man; ſo that he is highly extolled for his mercy, clemency, and wiſdom. He is thought to have been the *So* mentioned in ſcripture, and who entered into a league with Hoſhea king of Iſrael againſt Shalmaneſer king of Aſſyria. He is ſaid to have been excited to the invaſion of Egypt by a dream or viſion, in which he was aſſured, that he ſhould hold that kingdom for 50 years. Accordingly, he conquered Egypt, as had been foretold; and at the expiration of the time above mentioned, he had another dream, in which the tutelar god of Thebes acquainted him, that he could no longer hold the kingdom of Egypt with ſafety and happineſs, unleſs he maſſacred the prieſts as he paſſed through them with his guards. Being haunted with this viſion, and at the ſame time abhorring to hold the kingdom on ſuch terms, he ſent for the prieſts, and acquainted them with what ſeemed to be the will of the gods. Upon this it was concluded, that it was the pleaſure of the Deity that Sabbaco ſhould remain no longer in Egypt; and therefore he immediately quitted that kingdom, and returned to Ethiopia.

Of *Anyſias*, who was Sabbaco's immediate ſucceſſor, we have no particulars worth notice.

9 Remarkable ſtory of Sethon.

After him reigned one Sethon, who was both king and prieſt of Vulcan. He gave himſelf up to religious contemplation; and not only neglected the military claſs, but deprived them of their lands. At this they were ſo much incenſed, that they entered into an agreement not to bear arms under him; and in this ſtate of affairs Sennacherib king of Aſſyria arrived before Peluſium with a mighty army. Sethon now applied to his ſoldiers, but in vain: they unanimouſly perſiſted in refuſing to march under his banner. Being therefore deſtitute of all human aid, he applied to the god Vulcan, and requeſted him to deliver him from his enemies. Whilſt he was yet in the temple of that god, it is ſaid he fell into a deep ſleep; during which, he ſaw Vulcan ſtanding at his ſide, and exhorting him to take courage. He promiſed, that if Sethon would but go out againſt the Aſſyrians, he ſhould obtain a complete victory over them. Encouraged by this aſſurance, the king aſſembled a body of artificers, ſhop-keepers, and labourers; and, with this undiſciplined rabble, marched towards Peluſium. He had no occaſion, however, to fight; for the very night after his arrival at Peluſium, an innumerable multitude of field-rats entering the enemies camp, gnawed to pieces the quivers, bowſtrings, and ſhield-ſtraps. Next morning, when Sethon found the enemy diſarmed, and on that account beginning to fly, he purſued them to a great diſtance, making a terrible ſlaughter. In memory of this extraordinary event, a ſtatue of Sethon was erected in the temple of Vulcan, holding in one hand a rat, and delivering theſe words: "Whoſoever beholdeth me, let him be pious."

Soon after the death of Sethon, the form of government in Egypt was totally changed. The kingdom was divided into twelve parts, over which as many of the chief nobility preſided. This diviſion, however, ſubſiſted but for a ſhort time.

10 Reign of Pſammitichus.

Pſammitichus, one of the twelve, dethroned all the reſt, 15 years after the diviſion had been made. The hiſtory now begins to be diveſted of fable; and from this time may be accounted equally certain with that of any other nation. The vaſt conqueſts of Seſoſtris were now no longer known; for Pſammitichus poſſeſſed no more than the country of Egypt itſelf. It appears, indeed, that none of the ſucceſſors of Seſoſtris, or even that monarch himſelf, had made uſe of any means to keep in ſubjection the countries he had once conquered. Perhaps, indeed, his deſign originally was rather to *pillage* than to conquer; and therefore, on his return, his vaſt empire vaniſhed at once. Pſammitichus, however, endeavoured to extend his dominions by making war on his neighbours; but by putting more confidence in foreign auxiliaries than in his own ſubjects, the latter were ſo much offended, that upwards of 200,000 fighting men emigrated in a body, and took up their reſidence in Ethiopia.—To repair this loſs, Pſammitichus earneſtly applied himſelf to the advancement of commerce; and opened his ports to all ſtrangers, whom he greatly careſſed, contrary to the cruel maxims of his predeceſſors, who refuſed to admit them into the country. He alſo laid ſiege to the city of Azotus in Syria, which held out for 29 years againſt the whole ſtrength of the kingdom; from which we may gather, that, as a warrior, Pſammitichus was by no means remarkable. He is reported to have been the firſt king of Egypt that drank wine. He alſo ſent to diſcover the ſprings of the Nile; and is ſaid to have attempted to diſcover the moſt ancient nation in the world by the following method. Having procured two newly born children, he cauſed them to be brought up in ſuch a manner that they never heard a human voice. He imagined that theſe children would naturally ſpeak the original language of mankind: therefore, when, at two years of age, they pronounced the Phrygian word *beccos* (or ſome ſound reſembling it), which ſignifies bread, he concluded that the Phrygians were the moſt ancient people in the world.

11 Succeeded by Nechus.

Nechus, the ſon and ſucceſſor of Pſammitichus, is the *Pharaoh-Necho* of ſcripture, and was a prince of an enterpriſing and warlike genius. In the beginning of his reign, he attempted to cut through the iſthmus of Suez, between the Red Sea and the Mediterranean; but, through the invincible obſtacles which nature has thrown in the way of ſuch undertakings, he was obliged to abandon the enterprize, after having loſt 120,000 men in the attempt. After this he ſent a ſhip, manned with ſome expert Phœnician mariners, on a voyage to explore the coaſts of Africa. Accordingly, they performed the voyage; ſailed round the continent of Africa; and after three years returned to Egypt, where their relation was deemed incredible.

12
His wars with Joſiah and Nebuchadnezzar.

The moſt remarkable wars in which this king was engaged, are recorded in the ſacred writings. He went out againſt the king of Aſſyria, by the divine command, as he himſelf told Joſiah; but being oppoſed by this king of Judæa, he defeated and killed him at Megiddo; after which he ſet up, in that country, king Jehoiakim, and impoſed on him an annual tribute of 100 talents of ſilver and one talent of gold. He then proceeded againſt the king of Aſſyria; and weakened him ſo much, that the empire was ſoon after diſſolved. Thus he became maſter of Syria and Phœnicia; but in a ſhort time, Nebuchadnezzar king of Babylon came againſt him with a mighty army. The Egyptian monarch, not daunted by the formidable appearance of his antagoniſt, boldly ventured a battle; but was overthrown with prodigious ſlaughter, and Nebuchadnezzar became maſter of all the country to the very gates of Peluſium.

13
Apries a martial and ſucceſsful prince.

14
Bad conſequences of his alliance with Zedekiah.

15
His ſubjects revolt.

The reign of Apries, the *Pharaoh-Hophra* of Scripture, preſents us with a new revolution in the Egyptian affairs. He is repreſented as a martial prince, and in the beginning of his reign very ſucceſsful. He took by ſtorm the rich city of Sidon; and having overcome the Cypriots and Phœnicians in a ſea-fight, returned to Egypt laden with ſpoil. This ſucceſs probably incited Zedekiah king of Judæa to enter into an alliance with him againſt Nebuchadnezzar king of Babylon. The bad ſucceſs of this alliance was foretold by the prophet Jeremiah; and accordingly it happened. For Nebuchadnezzar having ſat down with his army before Jeruſalem, Apries marched from Egypt with a deſign to relieve the city; but no ſooner did he perceive the Babylonians approaching him, than he retreated as faſt as he could, leaving the Jews expoſed to the rage of their mercileſs enemies; who were thereupon treated as Jeremiah had foretold; and by this ſtep Apries brought upon himſelf the vengeance denounced by the ſame prophet.—The manner in which theſe predictions were fulfilled is as follows: The Cyreneans, a colony of the Greeks, being greatly ſtrengthened by a numerous ſupply of their countrymen under their third king *Battus* ſtyled *the Happy*, and encouraged by the Pythian oracle, began to drive out their Libyan neighbours, and ſhare their poſſeſſions among themſelves. Hereupon Andican king of Libya ſent a ſubmiſſive embaſſy to Apries, and implored his protection againſt the Cyreneans. Apries complied with his requeſt, and ſent a powerful army to his relief. The Egyptians were defeated with great ſlaughter; and thoſe who returned complained that the army had been ſent off by Apries in order to be deſtroyed, and that he might tyrannize without controul over the remainder of his ſubjects. This thought catching the attention of the giddy multitude, an almoſt univerſal defection enſued. Apries ſent one Amaſis, a particular friend, in whom he thought he could confide, to bring back his people to a ſenſe of their duty. But by this friend he was betrayed; for Amaſis, taking the opportunity of the preſent ferment, cauſed himſelf to be proclaimed king. Apries then diſpatched one Patarbemis, with orders to take Amaſis, and bring him alive before him. This he found impoſſible, and therefore returned without his priſoner; at which the king was ſo enraged, that he commanded Patarbemis's noſe and ears to be cut off. This piece of cruelty completed his ruin; for when the reſt of the Egyptians who continued faithful to Apries beheld the inhuman mutilation of ſo worthy and noble a perſon as Patarbemis was, they to a man deſerted Apries, and went over to Amaſis.

16
Apries defeated and taken priſoner by Amaſis.

Both parties now prepared for war; the uſurper having under his command the whole body of native Egyptians; and Apries only thoſe Ionians, Carians, and other mercenaries whom he could engage in his ſervice. The army of Apries amounted only to 30,000; but, though greatly inferior in number to the troops of his rival, as he well knew that the Greeks were much ſuperior in valour, he did not doubt of victory. Nay, ſo far was Apries puffed up with this notion, that he did not believe it was in the power even of any *God* to deprive him of his kingdom. The two armies ſoon met, and drew up in order of battle near Memphis. A bloody engagement enſued; in which, though the army of Apries behaved with the greateſt reſolution, they were at laſt overpowered with numbers, and utterly defeated, the king himſelf being taken priſoner. Amaſis now took poſſeſſion of the throne without oppoſition. He confined Apries in one of his palaces, but treated him with great care and reſpect. The people, however, were implacable, and could not be ſatisfied while he enjoyed his life. Amaſis, therefore, at laſt found himſelf obliged to deliver him into their hands. Thus the prediction received its final completion: Apries was delivered up to thoſe *who ſought his life;* and who no ſooner had him in their power, than they ſtrangled him, and laid his body in the ſepulchre of his anceſtors.

17
Egypt invaded by Nebuchadnezzar.

During theſe inteſtine broils, which muſt have greatly weakened the kingdom, it is probable that Nebuchadnezzar invaded Egypt. He had been for 13 years before this employed in beſieging Tyre, and at laſt had nothing but an empty city for his pains. To make himſelf ſome amends, therefore, he entered Egypt, miſerably haraſſed the country, killed and carried away great numbers of the inhabitants, ſo that the country did not recover from the effects of this incurſion for a long time after. In this expedition, however, he ſeems not to have aimed at any permanent conqueſt, but to have been induced to it merely by the love of plunder, and of this he carried with him an immenſe quantity to Babylon.

18
Happy adminiſtration of Amaſis.

During the reign of Amaſis, Egypt is ſaid to have been perfectly happy, and to have contained 20,000 populous cities. That good order might be kept among ſuch vaſt numbers of people, Amaſis enacted a law, by which every Egyptian was bound once a-year to inform the governor of his province by what means he gained his livelihood; and if he failed of this, to put him to death. The ſame puniſhment he decreed to thoſe who could not give a ſatisfactory account of themſelves.

This monarch was a great favourer of the Greeks, and married a woman of Grecian extract. To many

Greek cities, as well as particular perſons, he made conſiderable preſents. Beſide theſe, he gave leave to the Greeks in general to come into Egypt, and ſettle either in the city of Naucratis, or carry on their trade upon the ſea-coaſts; granting them alſo temples, and places where they might erect temples to their own deities. He received alſo a viſit from Solon the celebrated Athenian lawgiver, and reduced the iſland of Cyprus under his ſubection.

19 Offends Cambyſes king of Perſia,

This great proſperity, however, ended with the death of Amaſis, or indeed before it. The Egyptian monarch had ſome how or other incenſed Cambyſes king of Perſia. The cauſe of the quarrel is uncertain; but whatever it was, the Perſian monarch vowed the deſtruction of Amaſis. In the mean time *Phanes* of Halicarnaſſus, commander of the Grecian auxiliaries in the pay of Amaſis, took ſome private diſguſt; and leaving Egypt, embarked for Perſia. He was a wiſe and able general, perfectly well acquainted with every thing that related to Egypt; and had great credit with the Greeks in that country. Amaſis was immediately ſenſible how great the loſs of this man would be to him, and therefore ſent after him a truſty eunuch with a ſwift galley. Phanes was accordingly overtaken in Lycia, but not brought back; for, making his guard drunk, he continued his journey to Perſia, and preſented himſelf before Cambyſes, as he was meditating the deſtruction of the Egyptian monarchy.

20 And Polycrates tyrant of Samos.

At this dangerous criſis alſo, the Egyptian monarch imprudently made Polycrates the tyrant of Samos his enemy. This man had been the moſt remarkable perhaps of any recorded in hiſtory, for an uninterrupted courſe of ſucceſs, without the intervention of one ſingle unfortunate event. Amaſis, who was at this time in ſtrict alliance with Polycrates, wrote him a letter, in which, after congratulating him on his proſperity, he told him that he was afraid leſt his ſucceſſes were too many, and he might be ſuddenly thrown down into the greateſt miſery. For this reaſon he adviſed him voluntarily to take away ſomething from his own happineſs; and to caſt away that which would grieve him moſt if he was accidentally to loſe it. Polycrates followed his advice, and threw into the ſea a ſignet of ineſtimable value. This, however, did not anſwer the intended purpoſe. The ſignet happened to be ſwallowed by a fiſh, which was taken a few days afterwards, and thus was reſtored to Polycrates. Of this Amaſis was no ſooner informed, than, conſidering Polycrates as really *unhappy*, and already on the brink of deſtruction, he reſolved to put an end to the friendſhip which ſubſiſted between them. For this purpoſe he diſpatched an herald to Samos, commanding him to acquaint Polycrates, that he renounced his alliance, and all the obligations between them; that he might not mourn his misfortunes with the ſorrow of a friend. Thus Amaſis left Polycrates at liberty to act againſt him, if he choſe to do ſo; and accordingly he offered to aſſiſt Cambyſes with a fleet of ſhips in his Egyptian expedition.

21 Egypt invaded by Cambyſes.

Amaſis had not, however, the misfortune to ſee the calamities of his country. He died about 525 years before Chriſt, after a reign of 44 years; and left the kingdom to his ſon Pſammenitus, juſt as Cambyſes was approaching the frontiers of the kingdom. The new prince was ſcarce ſeated on the throne, when the Perſians appeared. Pſammenitus drew together what forces he could, in order to prevent them from entering the kingdom. Cambyſes, however, immediately laid ſiege to Peluſium, and made himſelf maſter of it by the following ſtratagem: he placed in the front of his army a great number of cats, dogs, and other animals that were deemed ſacred by the Egyptians. He then attacked the city, and took it without oppoſition; the garriſon, which conſiſted entirely of Egyptians, not daring to throw a dart or ſhoot an arrow againſt their enemies, leſt they ſhould kill ſome of the holy animals.

22 Cruelty and defeat of the Egyptians.

Cambyſes had ſcarce taken poſſeſſion of the city, when Pſammenitus advanced againſt him with a numerous army. But before the engagement, the Greeks who ſerved under Pſammenitus, to ſhow their indignation againſt their treacherous countryman Phanes, brought his children into the camp, killed them in the preſence of their father and of the two armies, and then drank their blood. The Perſians, enraged at ſo cruel a ſight, fell upon the Egyptians with the utmoſt fury, put them to flight, and cut the greateſt part of them in pieces. Thoſe who eſcaped fled to Memphis, where they were ſoon after guilty of a horrid outrage. Cambyſes ſent a herald to them in a ſhip from Mitylene: but no ſooner did they ſee her come into the port, than they flocked down to the ſhore, deſtroyed the ſhip, and tore to pieces the herald and all the crew; afterwards carrying their mangled limbs into the city, in a kind of barbarous triumph. Not long after, they were obliged to ſurrender; and thus Pſammenitus fell into the hands of his inveterate enemy, who was now enraged beyond meaſure at the cruelties exerciſed upon the children of Phanes, the herald, and the Mitylenean ſailors.

23 Their dreadful puniſhment by Cambyſes.

The rapid ſucceſs of the Perſians ſtruck with ſuch terror the Libyans, Cyreneans, Barcæans, and other dependents or allies of the Egyptian monarch, that they immediately ſubmitted. Nothing now remained but to diſpoſe of the captive king, and revenge on him and his ſubjects the cruelties which they had committed. This the mercileſs victor executed in the ſevereſt manner. On the 10th day after Memphis had been taken, Pſammenitus and the chief of the Egyptian nobility were ignominiouſly ſent into one of the ſuburbs of that city. The king being there ſeated in a proper place, ſaw his daughter coming along in the habit of a poor ſlave with a pitcher to fetch water from the river, and followed by the daughters of the greateſt families in Egypt, all in the ſame miſerable garb, with pitchers in their hands, drowned in tears, and loudly bemoaning their miſerable ſituation. When the fathers ſaw their daughters in this diſtreſs, they burſt into tears, all but Pſammenitus, who only caſt his eyes on the ground and kept them fixed there. After the young women, came the ſon of Pſammenitus, with 2000 of the young nobility, all of them with bits in their mouths and halters round their neck, led to execution. This was done to expiate the murder of the Perſian herald and the Mitylenean ſailors; for Cambyſes cauſed ten Egyptians of the firſt rank to be publicly executed for every one of thoſe that had been ſlain. Pſammenitus, however, obſerved the ſame conduct as before, keeping his eyes ſtedfaſtly fixed on the ground, though all the Egyptians around him made the loudeſt lamentations.

tions. A little after this he ſaw an intimate friend and companion, now advanced in years, who having been plundered of all he had, was begging his bread from door to door in the ſuburbs. As ſoon as he ſaw this man, Pſammenitus wept bitterly; and calling out to him by his name, ſtruck himſelf on the head as if he had been frantic. Of this the ſpies who had been ſet over him to obſerve his behaviour, gave immediate notice to Cambyſes, who thereupon ſent a meſſenger to inquire the cauſe of ſuch immoderate grief. Pſammenitus anſwered, That the calamities of his own family confounded him, and were too great to be lamented by any outward ſigns of grief; but the extreme diſtreſs of a boſom friend gave more room for reflection, and therefore extorted tears from him. With this anſwer Cambyſes was ſo affected, that he ſent orders to prevent the execution of the king's ſon; but theſe came too late, for the young prince had been put to death before any of the reſt. Pſammenitus himſelf was then ſent for into the city, and reſtored to his liberty: and had he not ſhowed a deſire of revenge, might perhaps have been truſted with the government of Egypt; but being diſcovered hatching ſchemes againſt the government, he was ſeized, and condemned to drink bull's blood.

24
Egypt becomes a province of the Perſian and afterwards of the Grecian empire.

The Egyptians were now reduced to the loweſt degree of ſlavery. Their country became a province of the Perſian empire: the body of Amaſis their late king was taken out of his grave; and after being mangled in a ſhocking manner, was finally burnt. But what ſeemed more grievous than all the reſt, their god Apis was ſlain, and his prieſts ignominiouſly ſcourged; and this inſpired the whole nation with ſuch an hatred to the Perſians, that they could never afterwards be reconciled to them. As long as the Perſian empire ſubſiſted, the Egyptians could never ſhake off their yoke. They frequently revolted indeed, but were always overthrown with prodigious loſs. At laſt they ſubmitted, without oppoſition, to Alexander the Great: after his death, Egypt again became a powerful kingdom; though ſince the conqueſt of it by Cambyſes to the preſent time, it hath never been governed but by foreign princes, agreeable to the prophecy of Ezekiel, "There ſhall be no more a prince of the land of Egypt."

25
Aſſigned to Ptolemy Lagus, who aſſumes the title of king.

On the death of Alexander the Great, Egypt, together with Libya, and that part of Arabia which borders on Egypt, were aſſigned to Ptolemy Lagus as governor under Alexander's ſon by Roxana, who was but newly born. Nothing was farther from the intention of this governor, than to keep the provinces in truſt for another. He did not, however, aſſume the title of *king*, till he perceived his authority ſo firmly eſtabliſhed that it could not be ſhaken; and this did not happen till 19 years after the death of Alexander, when Antigonus and Demetrius had unſucceſsfully attempted the conqueſt of Egypt.

From the time of his firſt eſtabliſhment on the throne, Ptolemy, who had aſſumed the title of *Soter*, reigned 20 years; which added to the former 19, make up the 39 years which hiſtorians commonly allow him to have reigned alone.—In the 39th year of his reign, he made one of his ſons, named *Philadelphus*, partner in the empire; declaring him his ſucceſſor, to the prejudice of his eldeſt ſon named *Ceraunus*; being excited thereto by his violent love for *Berenice* Philadelphus's mother. When the ſucceſſion was thus ſettled, Ceraunus immediately quitted the court; and fled at laſt into Syria, where he was received with open arms by Seleucus Nicator, whom he afterwards murdered.

26
Succeeded by Philadelphus.

The moſt remarkable tranſaction of this reign was the embelliſhing of the city of Alexandria, which Ptolemy made the capital of his new kingdom, and of which an account is given under the article ALEXANDRIA. About 284 years before Chriſt, died Ptolemy Soter, in the 41ſt year of his reign, and 84th of his age. He was the beſt prince of his race; and left behind him an example of prudence, juſtice, and clemency which few of his ſucceſſors choſe to follow. Beſides the provinces originally aſſigned to him, he has added to his empire thoſe of Cælo-Syria, Ethiopia, Pamphylia, Lycia, Caria, and ſome of the Cyclades. His ſucceſſor, Ptolemy Philadelphus, added nothing to the extent of the empire; nor did he perform any thing worthy of notice except embelliſhing further the city of Alexandria, and entering into an alliance with the Romans. In his time, one Magas, the governor of Libya and Cyrene, revolted; and held theſe provinces as an independent prince, notwithſtanding the utmoſt efforts of Ptolemy to reduce him. At laſt an accommodation took place; and a marriage was propoſed between Berenice, the only daughter of Magas, and Ptolemy's eldeſt ſon. The young princeſs was to receive all her father's dominions by way of dowry, and thus they would again be brought under the dominion of Ptolemy's family. But before this treaty could be put in execution, Magas died; and then Apamea, the princeſs's mother, did all ſhe could to prevent the match. This, however, ſhe was not able to do; tho' her efforts for that purpoſe produced a deſtructive war of four years continuance with Antiochus Theus king of Syria, and the acting of a cruel tragedy in the family of the latter. See SYRIA.

27
Ptolemy Euergetes a great conqueror.

About 246 years before Chriſt, Ptolemy Philadelphus died; and was ſucceeded by his eldeſt ſon Ptolemy, who had been married to Berenice the daughter of Magas, as above related. In the beginning of his reign, he found himſelf engaged in a war with Antiochus Theus king of Syria. From this he returned victorious, and brought with him 2500 ſtatues and pictures, among which were many of the ancient Egyptian idols, which had been carried away by Cambyſes into Perſia. Theſe were reſtored by Ptolemy to their ancient temples: in memory of which favour, the Egyptians gave him the ſurname of *Euergetes*, or the Beneficent. In this expedition he greatly enlarged his dominions, making himſelf maſter of all the countries that lie between mount Taurus and the confines of India. An account of theſe conqueſts was given by himſelf, inſcribed on a monument, to the following effect. "Ptolemy Euergetes, having received from his father the ſovereignty of Egypt, Libya, Syria, Phœnice, Cyprus, Lycia, Caria, and the other Cyclades, aſſembled a mighty army of horſe and foot, with a great fleet, and elephants, out of Trogloditia and Ethiopia; ſome of which had been taken by his father, and the reſt by himſelf, and brought from thence, and trained up for war; with this great force he ſailed into Aſia; and having conquered all the provinces which lie on this ſide the Euphrates, Cilicia, Pamphylia, Ionia, the

Helleſpont, and Thrace, he croſſed that river with all the forces of the conquered countries, and the kings of thoſe nations, and reduced Meſopotamia, Babylonia, Suſia, Perſia, Media, and all the country as far as Bactria.”

On the king's return from this expedition, he paſſed through Jeruſalem, where he offered many ſacrifices to the God of Iſrael, and ever afterwards expreſſed a great favour for the Jewiſh nation. At this time, the Jews were tributaries to the Egyptian monarchs, and paid them annually 20 talents of ſilver. This tribute, however, Onias, who was then high prieſt, being of a very covetous diſpoſition, had for a long time neglected to pay, ſo that the arrears amounted to a very large ſum. Soon after his return, therefore, Ptolemy ſent one of his courtiers named *Athenion* to demand the money, and deſired him to acquaint the Jews that he would make war upon them in caſe of a refuſal. A young man, however, named *Joſeph*, nephew to Onias, not only found means to avert the king's anger, but even got himſelf choſen his receiver-general, and by his faithful diſcharge of that important truſt, continued in high favour with Ptolemy as long as he lived.

Ptolemy Euergetes having at laſt concluded a peace with Seleucus the ſucceſſor of Antiochus Theus king of Syria, attempted the enlargement of his dominions on the ſouth ſide. In this he was attended with ſuch ſucceſs, that he made himſelf maſter of all the coaſts of the Red Sea, both on the Arabian and Ethiopian ſides, quite down to the ſtraits of Babel-mandel. On his return he was met by ambaſſadors from the Achæans, imploring his aſſiſtance againſt the Etolians and Lacedemonians. This the king readily promiſed them: but they having in the mean time engaged Antigonus king of Macedon to ſupport them, Ptolemy was ſo much offended, that he ſent powerful ſuccours to Cleomenes king of Sparta; hoping, by that means, to humble both the Achæans and their new ally Antigonus. In this, however, he was diſappointed; for Cleomenes, after having gained very conſiderable advantages over the enemy, was at laſt entirely defeated in the battle of Sellaſia, and obliged to take refuge in Ptolemy's dominions. He was received by the Egyptian monarch with the greateſt demonſtrations of kindneſs; a yearly penſion of 24 talents was aſſigned him, with a promiſe of reſtoring him to the Spartan throne; but before this could be accompliſhed, the king of Egypt died, in the 27th year of his reign, and was ſucceeded by his ſon Ptolemy Philopater.

28
Cleomenes king of Sparta takes refuge in Egypt.

Thus we have ſeen the Egyptian empire brought to a very great height of power; and had the ſucceeding monarchs been careful to preſerve that ſtrength of empire tranſmitted to them by Euergetes, it is very probable that Egypt might have been capable of holding the balance againſt Rome, and after the deſtruction of Carthage prevented that haughty city from becoming miſtreſs of the world. But after the death of Ptolemy Euergetes, the Egyptian empire, being governed only by weak or vicious monarchs, quickly declined, and from that time makes no conſpicuous figure in hiſtory.

29
Ptolemy Philopater a cruel tyrant.

Ptolemy Philopater began his reign with the murder of his brother; after which, giving himſelf up to all manner of licentiouſneſs, the kingdom fell into a kind of anarchy. Cleomenes the Spartan king ſtill reſided at court; and being now unable to bear the diſſolute manners which prevailed there, he preſſed Philopater to give him the aſſiſtance he had promiſed for reſtoring him to the throne of Sparta. This he the rather inſiſted upon, becauſe he had received advice that Antigonus king of Macedon was dead, that the Achæans were engaged in a war with the Etolians, and that the Lacedemonians had joined the latter againſt the Achæans and Macedonians. Ptolemy, when afraid of his brother Magas, had indeed promiſed to aſſiſt the king of Sparta with a powerful fleet, hoping by this means to attach him to his own intereſt: but now when Magas was out of the way, it was determined by the king, or rather his miniſters, that Cleomenes ſhould not be aſſiſted, nor even allowed to leave the kingdom; and this extravagant reſolution produced the deſperate attempt of Cleomenes, of which an account is given in the hiſtory of SPARTA.

Of the diſorders which now enſued in the government, Antiochus king of Syria, ſurnamed *the Great*, took the advantage, and attempted to wreſt from Ptolemy the provinces of Cælo-Syria and Paleſtine. But in this he was finally diſappointed; and might eaſily have been totally driven out of Syria, had not Ptolemy been too much taken up with his debaucheries to think of carrying on the war. The diſcontent occaſioned by this piece of negligence ſoon produced a civil war in his dominions, and the whole kingdom continued in the utmoſt confuſion till his death, which happened in the 17th year of his reign and 37th of his age.

30
Extraordinary ſtory concerning the Jews.

During the reign of Philopater happened a very extraordinary event with regard to the Jews, which is mentioned in the Maccabees*. The king of Egypt, while on his Syrian expedition, had attempted to enter the temple of Jeruſalem; but being hindered by the Jews, he was filled with the utmoſt rage againſt the whole nation. On his return to Alexandria, he reſolved to make thoſe who dwelt in that city feel the firſt effects of his vengeance. He began with publiſhing a decree, which he cauſed to be engraved on a pillar erected for that purpoſe at the gate of his palace, excluding all thoſe who did not ſacrifice to the gods worſhipped by the king. By this means the Jews were debarred from ſuing to him for juſtice, or obtaining his protection when they happened to ſtand in need of it. By the favour of Alexander the Great, Ptolemy Soter and Euergetes, the Jews enjoyed at Alexandria the ſame privileges with the Macedonians. In that metropolis the inhabitants were divided into three ranks or claſſes. In the firſt were the Macedonians, or original founders of the city, and along with them were enrolled the Jews; in the ſecond were the mercenaries who had ſerved under Alexander; and in the third the native Egyptians. Ptolemy now, to be revenged of the Jews, ordered, by another decree, that they ſhould be degraded from the firſt rank, and enrolled among the native Egyptians. By the ſame decree it was enacted, that all of that nation ſhould appear at an appointed time before the proper officers, in order to be enrolled among the common people; that at the time of their inrollment they ſhould have the mark of an ivy leaf, the badge of Bacchus, impreſſed with a hot iron on their faces; that all who were thus marked ſhould be made ſlaves; and, laſtly, that if any one ſhould ſtand out againſt this decree, he ſhould be immediately put to death. That he might not, however, ſeem an enemy to the whole nation, he declared, that thoſe who ſacrificed to his gods ſhould enjoy their former privileges, and remain in the ſame claſs. Yet, notwithſtanding this tempting offer, 300 only out of many thouſand Jews who lived in Alexandria could be prevailed upon to abandon their religion in order to ſave themſelves from ſlavery.

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* L. iii. 1, 3, 4, 5.

The apoſtates were immediately excommunicated by their brethern: and this their enemies conſtrued as done in oppoſition to the king's order; which threw the tyrant into ſuch a rage, that he reſolved to extirpate the whole nation, beginning with the Jews who lived in Alexandria and other cities of Egypt, and proceeding from thence to Judæa and Jeruſalem itſelf. In conſequence of this cruel reſolution, he commanded all the Jews that lived in any part of Egypt to be brought in chains to Alexandria, and there to be ſhut up in the Hippodrome, which was a very ſpacious place without the city, where the people uſed to aſſemble to ſee horſe-races and other public diverſions. He then ſent for Herman maſter of the elephants; and commanded him to have 500 of theſe animals ready againſt the next day, to let looſe upon the Jews in the Hippodrome. But when the elephants were prepared for the execution, and the people were aſſembled in great crowds to ſee it, they were for that day diſappointed by the king's abſence. For, having been late up the night before with ſome of his debauched companions, he did not awake till the time for the ſhew was over, and the ſpectators returned home. He therefore ordered one of his ſervants to call him early on the following day, that the people might not meet with a ſecond diſappointment. But when the perſon awaked him according to his order, the king was not yet returned to his ſenſes; having withdrawn, exceedingly drunk, only a ſhort time before. As he did not remember the order, he therefore fell into a violent paſſion, and threatened with death the ſervant who had awaked him; and this cauſed the ſhew to be put off till the third day. At laſt the king came to the Hippodrome attended with a vaſt multitude of ſpectators; but when the elephants were let looſe, inſtead of falling upon the Jews, they turned their rage againſt the ſpectators and ſoldiers, and deſtroyed great numbers of them. At the ſame time, ſome frightful appearances which were ſeen in the air ſo terrified the king, that he commanded the Jews to be immediately ſet at liberty, and reſtored them to their former privileges. No ſooner were they delivered from this danger than they demanded leave to put to death ſuch of their nation as had abandoned their religion; and this being granted, they diſpatched the apoſtates without excepting a ſingle man.

31
Ptolemy Philometor taken priſoner by Antiochus, and Phyſcon raiſed to the throne.

Philopater was ſucceeded by Ptolemy Epiphanes; and he, after a reign of 24 years, by Ptolemy Philometor. In the beginning of his reign, a war commenced with the king of Syria, who had ſeized on the provinces of Cœle-Syria and Paleſtine in the preceding reign. In the courſe of this war, Philometor was either voluntarily delivered up to Antiochus or taken priſoner. But however this was, the Alexandrians deſpairing of his ever being able to recover his liberty, raiſed to the throne his brother Ptolemy, who took the name of *Euergetes II.* but was afterwards called *Phyſcon*, or "the great-bellied," on account of the prominent belly which by his gluttony and luxury he had acquired.

32
Philometor reſtored, and reigns jointly with his brother.

He was ſcarce ſeated on the throne, however, when Antiochus Epiphanes, returning into Egypt, drove out Phyſcon, and reſtored the whole kingdom, except Peluſium, to Philometor. His deſign was to kindle a war betwixt the two brothers, ſo that he might have an opportunity of ſeizing the kingdom for himſelf. For this reaſon he kept to himſelf the city of Peluſium; which being the key of Egypt, he might at his pleaſure re-enter the country. But Philometor, appriſed of his deſign, invited his brother Phyſcon to an accommodation; which was happily effected by their ſiſter Cleopatra. In virtue of this agreement, the brothers were to reign jointly, and to oppoſe to the utmoſt of their power Antiochus, whom they conſidered as a common enemy. On this the king of Syria invaded Egypt with a mighty army, but was prevented by the Romans from conquering it.

33
Differences between the two brothers decided by the Roman ſenate.

The two brothers were no ſooner freed from the apprehenſions of a foreign enemy than they began to quarrel with each other. Their differences ſoon came to ſuch a height, that the Roman ſenate interpoſed. But before the ambaſſadors employed to inquire into the merits of the cauſe could arrive in Egypt, Phyſcon had driven Philometor from the throne, and obliged him to quit the kingdom. On this the dethroned prince fled to Rome, where he appeared meanly dreſſed, and without attendants. He was very kindly received by the ſenate; who were ſo well ſatisfied of the injuſtice done him, that they immediately decreed his reſtoration. He was reconducted accordingly; and, on the arrival of the ambaſſadors in Egypt, an accommodation between the two brothers was negociated. By this agreement, Phyſcon was put in poſſeſſion of Libya and Cyrene, and Philometor of all Egypt and the iſland of Cyprus; each of them being declared independent of the other in the dominion allotted to them. The treaty, as uſual, was confirmed with oaths and ſacrifices, and was broken almoſt as ſoon as made. Phyſcon was diſſatisfied with his ſhare of the dominions; and therefore ſent ambaſſadors to Rome, deſiring that the iſland of Cyprus might be added to his other poſſeſſions. This could not be obtained by the ambaſſadors; and therefore Phyſcon went to Rome in perſon.

34
Iſland of Cyprus adjudged to Phyſcon.

His demand was evidently unjuſt; but the Romans, conſidering that it was their intereſt to weaken the power of Egypt as much as poſſible, without further ceremony adjudged the iſland to him.

Phyſcon ſet out from Rome with two ambaſſadors; and arriving in Greece on his way to Cyprus, he raiſed there a great number of mercenaries, with a deſign to ſail immediately to that iſland and conquer it. But the Roman ambaſſadors telling him, that they were commanded to put him in poſſeſſion of it by fair means and not by force, he diſmiſſed his army, and returned to Libya, while one of the ambaſſadors proceeded to Alexandria. Their deſign was to bring the two brothers to an interview on the frontiers of their dominions, and there to ſettle matters in an amicable manner. But the ambaſſador who went to Alexandria, found Philometor very averſe from compliance with the decree of the ſenate. He put off the ambaſſador ſo long, that Phyſcon ſent the other alſo to Alexandria, hoping that the joint perſuaſions of the two would in-

35
Philometor refuſes to comply.

duce Philometor to comply. But the king, after entertaining them at an immenſe charge for 40 days, at laſt plainly refuſed to ſubmit, and told the ambaſſadors that he was reſolved to adhere to the firſt treaty. With this anſwer the Roman ambaſſadors departed, and were followed by others from the two brothers. The ſenate, however, not only confirmed their decree in favour of Phyſcon, but renounced their alliance with Philometor, and commanded his ambaſſador to leave the city in five days.

36
Rebellion againſt Phyſcon.

In the mean time, the inhabitants of Cyrene having heard unfavourable accounts of Phyſcon's behaviour during the ſhort time he reigned in Alexandria, conceived ſo ſtrong an averſion againſt him, that they reſolved to keep him out of their country by force of arms. On receiving intelligence of this reſolution, Phyſcon dropped all thoughts of Cyprus for the preſent; and haſtened with all his forces to Cyrene, where he ſoon got the better of his rebellious ſubjects, and eſtabliſhed himſelf in the kingdom. His vicious and tyrannical conduct, however, ſoon eſtranged from him the minds of his ſubjects, in ſuch a manner, that ſome of them entering into a conſpiracy againſt him, fell upon him one night as he was returning to his palace, wounded him in ſeveral places, and left him for dead on the ſpot. This he laid to the charge of his brother Philometor; and as ſoon as he was recovered, took another voyage to Rome. Here he made his complaints to the ſenate, and ſhowed them the ſcars of his wounds, accuſing his brother of having employed the aſſaſſins from whom he received them. Though Philometor was known to be a man of a moſt humane and mild diſpoſition, and therefore very unlikely to have been concerned in ſo black an attempt; yet the ſenate, being offended at his refuſing to ſubmit to their decree concerning the iſland of Cyprus, hearkened to this falſe accuſation; and carried their prejudice ſo far, that they not only refuſed to hear what his ambaſſadors had to ſay, but ordered them immediately to depart from the city. At the ſame time, they appointed five commiſſioners to conduct Phyſcon into Cyprus, and put him in poſſeſſion of that iſland, enjoining all their allies in thoſe parts to ſupply him with forces for that purpoſe.

37
He is defeated and taken priſoner by Philometor.

Phyſcon having by this means got together an army which ſeemed to him to be ſufficient for the accompliſhment of his deſign, landed in Cyprus; but being there encountered by Philometor in perſon, he was entirely defeated, and obliged to ſhelter himſelf in a city called *Lapitho*. Here he was cloſely beſieged, and at laſt obliged to ſurrender. Every one now expected that Phyſcon would have been treated as he deſerved; but his brother, inſtead of puniſhing, reſtored him to the government of Libya and Cyrene, adding ſome other territories inſtead of the iſland of Cyprus, and promiſing him his daughter in marriage. Thus an end was put to the war between the two brothers; for the Romans were aſhamed any longer to oppoſe a prince who had given ſuch a ſignal inſtance of his juſtice and clemency.

On his return to Alexandria, Philometor appointed one Archias governor of Cyprus. But he, ſoon after the king's departure, agreed with Demetrius king of Syria, to betray the iſland to him for 500 talents. The treachery was diſcovered before it took effect; and the traitor, to avoid the puniſhment due to his crime, laid violent hands on himſelf. Ptolemy being offended with Demetrius for this attempt on Cyprus, joined Attalus king of Pergamus, and Ariarathes king of Cappadocia, in ſetting up a pretender to the crown of Syria. This was Alexander Balas; to whom he even gave his daughter Cleopatra in marriage, after he had placed him on the throne of Syria. But he, notwithſtanding theſe and many other favours, being ſuſpected of having entered into a plot againſt his benefactor, Ptolemy became his greateſt enemy; and marching againſt him, routed his army in the neighbourhood of Antioch. He did not, however, long enjoy his victory; for he died in a few days after the engagement, of the wounds he had received.

38
Death of Philometor.

On the death of Philometor, Cleopatra the queen deſigned to ſecure the throne for her ſon. But ſome of the principal nobility declaring for Phyſcon, a civil war was about to enſue, when matters were compromiſed on condition that Phyſcon ſhould marry Cleopatra, that he ſhould reign jointly with her during his life, and declare her ſon by Philometor heir to the crown. Theſe terms were no ſooner agreed upon than Phyſcon married Cleopatra, and, on the very day of the nuptials, murdered her ſon in her arms.—This was only a prelude to the cruelties which he afterwards practiſed on his ſubjects. He was no ſooner ſeated on the throne, than he put to death all thoſe who had ſhown any concern for the murder of the young prince. He then wrecked his fury on the Jews, whom he treated more like ſlaves than ſubjects, on account of their having favoured the cauſe of Cleopatra. His own people were treated with little more ceremony. Numbers of them were every day put to death for the ſmalleſt faults, and often for no fault at all, but merely to gratify his unhuman temper. His cruelty towards the Alexandrians is particularly mentioned under the article ALEXANDRIA.—In a ſhort time, being wearied of his queen, who was alſo his ſiſter, he divorced her; and married her daughter, who was alſo called *Cleopatra*, and whom he had previouſly raviſhed. In ſhort, his behaviour was ſo exceedingly wicked, that it ſoon became quite intolerable to his ſubjects; and he was obliged to fly to the iſland of Cyprus with his new queen, and *Memphitis*, a ſon he had by her mother.

39
Mo[illegible] wicked[illegible] of Phy[illegible]

40
He is driven out.

On the flight of the king, the divorced queen was placed on the throne by the Alexandrians; but Phyſcon, fearing leſt a ſon whom he had left behind ſhould be appointed king, ſent for him into Cyprus, and cauſed him to be aſſaſſinated as ſoon as he landed. This provoked the people againſt him to ſuch a degree, that they pulled down and daſhed to pieces all the ſtatues which had been erected to him in Alexandria. This the tyrant ſuppoſed to have been done at the inſtigation of the queen, and therefore reſolved to revenge it on her by killing his own ſon whom he had by her. He therefore, without the leaſt remorſe, cauſed the young prince's throat to be cut; and having put his mangled limbs into a box, ſent them as a preſent to his mother Cleopatra. The meſſenger with whom this box was ſent, was one of his guards. He was ordered to wait till the queen's birth-day, which approached, and was to be celebrated with extraordinary pomp; and in the midſt of the general rejoicing, he was to deliver the preſent.

41
Murders his ſon.

The horror and deteſtation occaſioned by this unexampled piece of cruelty cannot be expreſſed. An army was ſoon raiſed, and the command of it given to one *Marſyas*, whom the queen had appointed general, and enjoined to take all the neceſſary ſteps for the defence of the country. On the other hand, Phyſcon, having hired a numerous body of mercenaries, ſent them, under the command of one *Hegelochus*, againſt the Egyptians. The two armies met on the frontiers of Egypt, on which a bloody battle enſued; but at laſt the Egyptians were entirely defeated, and Marſyas was taken priſoner. Every one expected that the captive general would have been put to death with the ſevereſt torments; but Phyſcon, perceiving that his cruelties only exaſperated the people, reſolved to try whether he could regain their affections by lenity; and therefore pardoned Marſyas, and ſet him at liberty.—Cleopatra, in the mean time, being greatly diſtreſſed by this overthrow, demanded aſſiſtance from Demetrius king of Syria, who had married her eldeſt daughter by Philometor, promiſing him the crown of Egypt for his reward. Demetrius accepted the propoſal without heſitation, marched with all his forces into Egypt, and there laid ſiege to Peluſium. But he being no leſs hated in Syria than Phyſcon was in Egypt, the people of Antioch, taking advantage of his abſence, revolted againſt him, and were joined by moſt of the other cities in Syria. Thus Demetrius was obliged to return; and Cleopatra, being now in no condition to oppoſe Phyſcon, fled to Ptolemais, where her daughter the queen of Syria at that time reſided. Phyſcon was then reſtored to the throne of Egypt, which he enjoyed without further moleſtation till his death; which happened at Alexandria, in the 29th year of his reign, and 67th of his age.

42
Phyſcon reſtored.

43
Ptolemy Lathyrus driven out, and Alexander ſet up.

To Phyſcon ſucceeded Ptolemy Lathyrus, about 122 years before Chriſt; but he had not reigned long, before his mother, finding that he would not be entirely governed by her, by falſe ſurmiſes ſtirred up the Alexandrians, who drove him from the throne, and placed on it his youngeſt brother Alexander. Lathyrus after this was obliged to content himſelf with the government of Cyprus, which he was permitted to enjoy in quiet. Ptolemy Alexander, in the mean time, finding he was to have only the ſhadow of ſovereignty, and that his mother Cleopatra was to have all the power, ſtole away privately from Alexandria. The queen uſed every artifice to bring him back, as well knowing that the Alexandrians would never ſuffer her to reign alone. At laſt her ſon yielded to her intreaties; but ſoon after, underſtanding that ſhe had hired aſſaſſins to diſpatch him, he cauſed her to be murdered.

44
Lathyrus reſtored.

The death of the queen was no ſooner known to the Alexandrians, than, diſdaining to be commanded by a paricide, they drove out Alexander, and recalled Lathyrus.—The depoſed prince for ſome time led a rambling life in the iſland of Cos; but having got together ſome ſhips, he, the next year, attempted to return into Egypt. But being met by *Tyrrhus*, Lathyrus's admiral, he was defeated, and obliged to fly to Myra in Lycia. From Myra he ſteered his courſe towards Cyprus, hoping that the inhabitants would place him on the throne, inſtead of his brother. But *Chareas*, another of Lathyrus's admirals, coming up with him while he was ready to land, an engagement enſued, in which Alexander's fleet was diſperſed, and he himſelf killed.

45
Cyrenaica bequeathed to the Romans.

During theſe diſturbances, *Apion* king of Cyrenaica, the ſon of Ptolemy Phyſcon by a concubine, having maintained peace and tranquillity in his dominions during a reign of 21 years, died, and by his will left his kingdom to the Romans: and thus the Egyptian empire was conſiderably reduced and circumſcribed.

46
City of Thebes ruined.

Lathyrus being now delivered from all competitors, turned his arms againſt the city of Thebes, which had revolted from him. The king marched in perſon againſt the rebels; and, having defeated them in a pitched battle, laid cloſe ſiege to their city. The inhabitants defended themſelves with great reſolution for three years. At laſt, however, they were obliged to ſubmit, and the city was given up to be plundered by the ſoldiery. They left every where the moſt melancholy monuments of their avarice and cruelty; ſo that Thebes, which till that time had been one of the moſt wealthy cities of Egypt, was now reduced ſo low that it never afterwards made any figure.

47
Alexander II. ſucceeds Lathyrus.

About 76 years before Chriſt, Ptolemy Lathyrus was ſucceeded by Alexander II. He was the ſon of the Ptolemy Alexander for whom Lathyrus had been driven out; and had met with many adventures. He was firſt ſent by Cleopatra into the iſland of Cos, with a great ſum of money, and all her jewels; as thinking that was the ſafeſt place where they could be kept. When Mithridates king of Pontus made himſelf maſter of that iſland, the inhabitants delivered up to him the young Egyptian prince, together with all the treaſures. Mithridates gave him an education ſuitable to his birth; but he, not thinking himſelf ſafe with a prince who had ſhed the blood of his own children, fled to the camp of Sylla the Roman dictator, who was then making war in Aſia. From that time he lived in the family of the Roman general, till news was brought to Rome of the death of Lathyrus. Sylla then ſent him to Egypt to take poſſeſſion of the throne. But, before his arrival, the Alexandrians had choſen Cleopatra for their ſovereign. To compromiſe matters, however, it was agreed, that Ptolemy ſhould marry her, and take her for his partner in the throne. This was accordingly done; and 19 days after the marriage, the unhappy queen was murdered by her huſband, who for 15 years afterwards ſhowed himſelf ſuch a monſter of wickedneſs, that a general inſurrection at laſt enſued among his ſubjects, and he was obliged to fly to Pompey the Great, who was then carrying on the war againſt Mithridates king of Pontus. But Pompey refuſing to concern himſelf in the matter, he retired to the city of Tyre, where he died ſome months after.

48
Marries Cleopatra, and murders her.

49
Leaves his kingdom to the Romans.

When he was forced to ſhut himſelf up in the city of Tyre, Alexander had ſent ambaſſadors to Rome, in order to influence the ſenate in his favour. But, dying before the negociation was finiſhed, he made over by his laſt will all his rights to the Roman people, declaring them heirs to his kingdom: not out of any affection to the republic; but with a view to raiſe diſputes between the Romans and his rival Auletes, whom the Egyptians had placed on the throne. The will was brought to Rome, where it occaſioned warm debates. Some were for taking immediate poſſeſſion of the kingdom. Others thought that no notice ſhould be taken of ſuch a will, becauſe Alexander had no right to diſpoſe of his dominions in prejudice of his ſucceſſor, and to exclude from the crown thoſe who were of the royal blood of Egypt. Cicero repreſented, that ſuch a notorious impoſition would debaſe the majeſty of the Roman people, and involve them in endleſs wars and diſputes; that the fruitful fields of Egypt would be a ſtrong temptation to the avarice of the people, who would inſiſt on their being divided among them; and laſtly, that by this means the bloody quarrels about the Agrarian laws would be revived. Theſe reaſons had ſome weight with the ſenate; but what chiefly prevented them from ſeizing on Egypt at this time was, that they had lately taken poſſeſſion of the kingdom of Bithynia in virtue of the will of Nicomedes, and of Cyrene and Libya by the will of Apion. They thought, therefore, that if they ſhould, on the like pretence, take poſſeſſion of the kingdom of Egypt, this might too much expoſe their deſign of ſetting up a kind of univerſal monarchy, and occaſion a formidable combination againſt them.

50
Character of Auletes the new king.

Auletes, who was now raiſed to the throne by the Egyptians, is ſaid to have ſurpaſſed all the kings that went before him in the effeminacy of his manners. The name *Auletes*, which ſignifies the *flute-player*, was given him becauſe he piqued himſelf on his ſkill in performing upon that inſtrument, and was not aſhamed even to contend for the prize in the public games. He took great pleaſure in imitating the manners of the Bacchanals; dancing in a female dreſs, and in the ſame meaſures that they uſed during the ſolemnity of their god Bacchus; and hence he had the ſurname of the *New Dionyſius* or *Bacchus*. As his title to the crown was diſputable (he being only the ſon of a concubine), the firſt care of Auletes was to get himſelf acknowledged by the Romans, and declared their ally. This was obtained by applying to Julius Cæſar, who was at that time conſul, and immenſely in debt. Cæſar being glad of ſuch an opportunity of raiſing money, made the king of Egypt pay pretty dear for his alliance. Six thouſand talents, a ſum equal to L. 1,162,500 Sterling, were paid partly to Cæſar himſelf, and partly to Pompey, whoſe intereſt was neceſſary for obtaining the conſent of the people. Though the revenues of Egypt amounted to twice this ſum, yet Auletes found it impoſſible for him to raiſe it without ſeverely taxing his ſubjects. This occaſioned a general diſcontent; and while the people were almoſt ready to take up arms, a moſt unjuſt decree paſſed at Rome for ſeizing the iſland of Cyprus. When the Alexandrians heard of the intentions of the republic, they preſſed Auletes to demand that iſland as an ancient appendage of Egypt; and, in caſe of a refuſal, to declare war againſt that haughty and imperious people, who, they now ſaw, though too late, aimed at nothing leſs than the ſovereignty of the world. With this requeſt the king refuſed to comply; upon which his ſubjects, already provoked beyond meaſure at the taxes with which they were loaded, flew to arms, and ſurrounded the palace. The king had the good luck to eſcape their fury, and immediately leaving Alexandria, ſet ſail for Rome.

51
Is acknowledged by the Romans.

52
Is driven from the throne, and flies to Rome.

In his way to that city, he landed on the iſland of Rhodes, where the famous Cato at that time was, being on his way to Cyprus, to put the unjuſt decree of the ſenate in execution. Auletes, deſirous to confer with a man of his prudence, immediately ſent to acquaint him with his arrival. He imagined, that, upon this notice, Cato would immediately come and wait upon him; but the proud Roman told the meſſenger, that if the king of Egypt had any thing to ſay to Cato, he might, if he thought proper, come to his houſe. Accordingly the king went to pay him a viſit; but was received with very little ceremony by Cato, who did not even vouchſafe to riſe out of his ſeat when he came into his preſence. When Auletes had laid his affairs before this haughty republican, he was blamed by him for leaving Egypt, the richeſt kingdom in the world, in order to expoſe himſelf, as he ſaid, to the indignities he would meet with at Rome. There Cato told him, that nothing was in requeſt but wealth and grandeur. All the riches of Egypt, he ſaid, would not be ſufficient to ſatiſfy the avarice of the leading men in Rome. He therefore adviſed him to return to Egypt; and ſtrive, by a more equitable conduct, to regain the affections of his people. He even offered to reconduct him thither, and employ his good offices in his behalf. But though Ptolemy was ſenſible of the propriety of this advice, the friends he had with him diſſuaded him from following it, and accordingly he ſet out for Rome.

53
Cato's advice to him.

54
Infamous conduct of Auletes.

On his arrival in this metropolis, the king found, to his great concern, that Cæſar, in whom he placed his greateſt confidence, was then in Gaul. He was received, however, by Pompey with great kindneſs. He aſſigned him an apartment in his own houſe, and omitted nothing that lay in his power to ſerve him. But, notwithſtanding the protection of ſo powerful a man, Auletes was forced to go from houſe to houſe like a private perſon, ſoliciting the votes of the ſenators. After he had ſpent immenſe treaſures in procuring a ſtrong party in the city, he was at laſt permitted to lay his complaints before the ſenate; and at the ſame time there arrived an embaſſy from the Alexandrians, conſiſting of 100 citizens, to acquaint the ſenate with the reaſons of their revolt.

55
Berenice raiſed to the throne of Egypt.

When Auletes firſt ſet out for Rome, the Alexandrians, not knowing what was become of him, placed on the throne his daughter Berenice; and ſent an embaſſy into Syria to Antiochus Aſiaticus, inviting him into Egypt to marry the queen, and reign in partnerſhip with her. Antiochus was dead before the arrival of the ambaſſadors; upon which the ſame propoſal was made to his brother Seleucus, who readily accepted it. This Seleucus is deſcribed by Strabo as monſtrouſly deformed in body, and ſtill more ſo in mind. The Egyptians nicknamed him *Cybioſactes*, or *the Scullion*; a name which ſeemed more fit for him than any other. He was ſcarce ſettled on the throne, when he gave a ſignal inſtance of his ſordid and avaricious temper. Ptolemy the firſt had cauſed the body of Alexander the Great to be depoſited in a coffin of maſſy gold. This the king ſeized upon; and by that means provoked his wife Berenice to ſuch a degree, that ſhe cauſed him to be murdered. She then married one Archelaus, high prieſt of Comana in Pontus, who pretended to be the ſon of Mithridates the Great; but was, in fact, only the ſon of that monarch's general.

56
She marries Seleucus, and murders him.

57
Marries Archelaus.

Auletes was not a little alarmed on hearing of theſe tranſactions, eſpecially when the ambaſſadors arrived, who he feared would overturn all the ſchemes he had laboured ſo much to bring about. The embaſſy was headed by one Dion, a celebrated academic philoſopher, 58 Auletes murders the Egyptian ambaſſadors.

who had many powerful friends at Rome. But Ptolemy found means to get both him and moſt of his followers aſſaſſinated; and this intimidated the reſt to ſuch a degree, that they durſt not execute their commiſſion, or, for ſome time, even demand juſtice for the murder of their colleagues.

59 His reſtoration decreed by the ſenate.

60 Gabinius undertakes to reſtore him for a great ſum.

The report of ſo many murders, however, at laſt ſpread a general alarm. Auletes, ſure of the protection of Pompey, did not ſcruple to own himſelf the perpetrator of them. Nay, though an action was commenced againſt one Aſcitius an aſſaſſin who had ſtabbed Dion the chief of the embaſſy above mentioned, and the crime was fully proved; yet he was acquitted by the venal judges, who had all been bribed by Ptolemy. In a ſhort time, the ſenate paſſed a decree, by which it was enacted, that the king of Egypt ſhould be reſtored by force of arms. All the great men in Rome were ambitious of this commiſſion; which, they well knew, would be attended with immenſe profit. Their conteſts on this occaſion took up a conſiderable time; and at laſt a prophecy of the Sybil was found out, which forbad the aſſiſting an Egyptian monarch with an army. Ptolemy, therefore, wearied out with ſo long a delay, retired from Rome, where he had made himſelf generally odious, to the temple of Diana at Epheſus, there to wait the deciſion of his fate. Here he remained a conſiderable time: but as he ſaw that the ſenate came to no reſolution, tho' he had ſolicited them by letters ſo to do; at laſt, by Pompey's advice, he applied to Gabinius the proconſul of Syria. This Gabinius was a man of a moſt infamous character, and ready to undertake any thing for money. Therefore, though it was contrary to an expreſs law for any governor to go out of his province without poſitive orders from the ſenate and people of Rome, yet Gabinius ventured to tranſgreſs this law, upon condition of being well paid for his pains. As a recompence for his trouble, however, he demanded 10,000 talents; that is, L.1,937,500 Sterling. Ptolemy, glad to be reſtored on any terms, agreed to pay the above mentioned ſum; but Gabinius would not ſtir till he had received one-half of it. This obliged the king to borrow it from a Roman knight named *Caius Rabirius Poſthumus;* Pompey interpoſing his credit and authority for the payment of the capital and intereſt.

61 Archelaus defeated and killed.

Gabinius now ſet out for Egypt, attended by the famous Mark Anthony, who at this time ſerved in the army under him. He was met by Archelaus, who ſince the departure of Auletes had reigned in Egypt jointly with Berenice, at the head of a numerous army. The Egyptians were utterly defeated, and Archelaus taken priſoner in the firſt engagement. Thus Gabinius might have put an end to the war at once: but his avarice prompted him to diſmiſs Archelaus on his paying a conſiderable ranſom; after which, pretending that he had made his eſcape, freſh ſums were demanded from Ptolemy for defraying the expences of the war. For theſe ſums Ptolemy was again obliged to apply to Rabirius, who lent him what money he wanted at a very high intereſt. At laſt, however, Archelaus was defeated and killed, and thus Ptolemy again became maſter of all Egypt.

62 Berenice put to death, and the people oppreſſed.

No ſooner was Auletes firmly ſettled on the throne, than he put to death his daughter Berenice, and oppreſſed his people with the moſt cruel exactions, in order to procure the money he had been obliged to borrow while in a ſtate of exile. Theſe oppreſſions and exactions the cowardly Egyptians bore with great patience, being intimidated by the garriſon which Gabinius had left in Alexandria. But neither the fear of the Romans, nor the authority of Ptolemy, could make them put up an affront offered to their religion. A Roman ſoldier happened to kill a cat, which was an animal held ſacred and even worſhipped by the Egyptians; and no ſooner was this ſuppoſed ſacrilege known, than the Alexandrians made a general inſurrection, and, gathering together in crowds, made their way through the Roman guards, dragged the ſoldier out of his houſe, and, in ſpite of all oppoſition, tore him in pieces.

63 Ingratitude of Auletes.

Notwithſtanding the heavy taxes, however, which Ptolemy laid on his people, it doth not appear that he had any deſign of paying his debts. Rabirius, who, as we have already obſerved, had lent him immenſe ſums, finding that the king affected delays, took a voyage to Egypt, in order to expoſtulate with him in perſon. Ptolemy paid very little regard to his expoſtulations; but excuſed himſelf on account of the bad ſtate of his finances. For this reaſon he offered to make Rabirius collector-general of his revenues, that he might in that employment pay himſelf. The unfortunate creditor accepted the employment for fear of loſing his debt. But Ptolemy, ſoon after, upon ſome frivolous pretence or other, cauſed him and all his ſervants to be cloſely confined. This baſe conduct exaſperated Pompey as much as Rabirius; for the former had been in a manner ſecurity for the debt, as the money had been lent at his requeſt, and the buſineſs tranſacted at a country-houſe of his near Alba. However, as Rabirius had reaſon to fear the worſt, he took the firſt opportunity of making his eſcape, glad to get off with life from his cruel and faithleſs debtor. To complete his misfortunes, he was proſecuted at Rome as ſoon as he returned, 1. For having enabled Ptolemy to corrupt the ſenate with ſums lent him for that purpoſe. 2. For having debaſed and diſhonoured the character of a Roman knight, by farming the revenues, and becoming the ſervant of a foreign prince. 3. For having been an accomplice with Gabinius, and ſharing with him the 10,000 talents which that proconſul had received for his Egyptian expedition. By the eloquence of Cicero he was acquitted; and one of the beſt orations to be found in the writings of that author was compoſed on this occaſion. Gabinius was alſo proſecuted; and, as Cicero ſpoke againſt him, he very narrowly eſcaped death. He was, however, condemned to perpetual baniſhment, after having been ſtripped of all he was worth. He lived in exile till the time of the civil wars, when he was recalled by Cæſar, in whoſe ſervice he loſt his life.

64 Leaves his children to the care of the Romans.

Auletes enjoyed the throne of Egypt about four years after his re-eſtabliſhment; and at his death left his children, a ſon and two daughters, under the tuition of the Roman people. The name of the ſon was *Ptolemy*, thoſe of the daughters were *Cleopatra* and *Arſinoe*. This was the Cleopatra who afterwards became ſo famous, and had ſo great a ſhare in the civil wars of Rome. As the tranſactions of the preſent reign, however, are ſo cloſely connected with the affairs of Rome, that they cannot be well underſtood without knowing the ſituation of the Romans at that time, we refer for an account of them to the *Hiſtory of Rome*.

65
State of Egypt till its conqueſt by the khalif of Cairwan.

With Cleopatra ended the family of Ptolemy Lagus, the founder of the Grecian empire in Egypt, after it had held that country in ſubjection for the ſpace of 294 years. From this time Egypt became a province of the Roman empire, and continued ſubject to the emperors of Rome or Conſtantinople. In the year 642, it was conquered by the Arabs under Amru Ebn al As, one of the generals of the khalif Omar. In the year 889, an independent government was ſet up in this kingdom by Ahmed Ebn Tolun, who rebelled againſt Al Mokhadi khalif of Bagdad. It continued to be governed by him and his ſucceſſors for 27 years, when it was again reduced by Al Moctaſi khalif of Bagdad. In about 30 years after, we find it again an independent ſtate, being joined with Syria under Mahomet Ebn Taj, who had been appointed governor of theſe provinces. This government, however, was alſo but ſhort-lived; for in the year 968 it was conquered by Jawhar, one of the generals of Moez Ledinillah, the Fatemite khalif of Cairwan in Barbary. See Barbary, n° 34.

66
Moez takes poſſeſſion of his new kingdom.

No ſooner was Moez informed of the ſucceſs of his general, than he prepared with all expedition to go and take poſſeſſion of his new conqueſt. Accordingly he ordered all the vaſt quantities of gold which he and his predeceſſors had amaſſed, to be caſt into ingots of the ſize and figure of the mill-ſtones uſed in hand-mills, and conveyed on camels backs into Egypt. To ſhow that he was fully determined to abandon his dominions in Barbary, and to make Egypt the reſidence of himſelf and his ſucceſſors, he cauſed the remains of the three former princes of his race to be removed from Cairwan in Barbary, and to be depoſited in a ſtately moſque erected for that purpoſe in the city of Cairo in Egypt. This was a moſt effectual method to induce his ſucceſſors to reſide in Egypt alſo, as it was become an eſtabliſhed cuſtom and duty among thoſe princes frequently to pay their reſpectful viſits to the tombs of their anceſtors.

67
Will not ſuffer prayers to be ſaid for the khalif of Bagdad.

To eſtabliſh himſelf the more effectually in his new dominions, Moez ſuppreſſed the uſual prayers made in the moſques for the khalifs of Bagdad, and ſubſtituted his own name in their ſtead. This was complied with, not only in Egypt and Syria, but even throughout all Arabia, the city of Mecca alone excepted. The conſequence was, a ſchiſm in the Mahommedan faith, which continued upwards of 200 years, and was attended with continual anathemas, and ſometimes deſtructive wars between the khalifs of Bagdad and of Egypt.—Having fully eſtabliſhed himſelf in his kingdom, he died in the 45th year of his age, three years after he had left his dominions in Barbary; and was ſucceeded by his ſon Abu Al Manſur Baiar, ſurnamed Aziz Billah.

68
Unſucceſsful expedition into Syria.

The new khalif ſucceeded to the throne at the age of 21; and committed the management of affairs entirely to the care of Jawhar, his father's long experienced general and prime miniſter. In 978, he ſent this famous warrior to drive out Al Aftekin, the emir of Damaſcus. The Egyptian general accordingly formed the ſiege of that place; but at the end of two months, was obliged to raiſe it, on the approach of an army of Karmatians under the command of Al Hakem. As Jawhar was not ſtrong enough to venture an engagement with theſe Karmatians, it was impoſſible for him to hinder them from effecting a junction with the forces of Al Aftekin. He therefore retreated, or rather fled, towards Egypt with the utmoſt expedition; but being overtaken by the two confederate armies, he was ſoon reduced to the laſt extremity. He was, however, permitted to reſume his march, on condition that he paſſed under Al Aftekin's ſword and Al Hakem's lance; and to this diſgraceful condition Jawhar found himſelf obliged to ſubmit. On his arrival in Egypt, he immediately adviſed Al Aziz to undertake an expedition in perſon into the eaſt, againſt the combined army of Turks, Karmatians, and Damaſcenes, under the command of Al Aftekin and Al Hakem. The khalif followed his advice; and advancing againſt his enemies, overthrew them with great ſlaughter. Al Aftekin himſelf eſcaped out of the battle; but was afterwards taken and brought to Al Aziz, who made him his chamberlain, and treated him with great kindneſs. Jawhar, in the mean time, was diſgraced on account of his bad ſucceſs; and in this diſgrace he continued till his death, which happened in the year of our Lord 990, and of the Hegira 381.

69
Aleppo beſieged without ſucceſs.

This year Al Aziz having received advice of the death of Saado'dawla prince of Aleppo, ſent a formidable army under the command of a general named *Manjubekin*, to reduce that place. Lulu, who had been appointed guardian to Saado'dawla's ſon, finding himſelf preſſed by the Egyptians, who carried on the ſiege with great vigour, demanded aſſiſtance from the Greek emperor. Accordingly, he ordered a body of troops to advance to Lulu's relief. Manjubekin, being informed of their approach, immediately raiſed the ſiege, and advanced to give them battle. An obſtinate engagement enſued, in which the Greeks were at laſt overthrown with great ſlaughter. After this victory, Manjubekin puſhed on the ſiege of Aleppo very briſkly; but finding the place capable of defending itſelf much longer than he at firſt imagined, and his proviſions beginning to fail, he raiſed the ſiege. The khalif upon this ſent him a very threatening letter, and commanded him to return before Aleppo. He did ſo; and continued the ſiege for 13 months; during all which time it was defended by Lulu with incredible bravery. At laſt, the Egyptians hearing that a numerous army of Greeks was on their way to relieve the city, they raiſed the ſiege, and fled with the utmoſt precipitation. The Greeks then took and plundered ſome of the cities which Al Aziz poſſeſſed in Syria; and Manjubekin made the beſt of his way to Damaſcus, where he ſet up for himſelf. Al Aziz being informed of this revolt, marched in perſon againſt him with a conſiderable army; but being taken ill by the way, he expired, in the 21ſt year of his reign and 42d of his age.

Al Aziz was ſucceeded by his ſon Abu Al Manſur, ſurnamed Al Hakem; who, being only 11 years of age, was put under the tuition of an eunuch of approved integrity.

70
Strange madneſs of the khalif Al Hakem.

This reign is remarkable for nothing ſo much as the madneſs with which the khalif was ſeized in the latter part of it. This manifeſted itſelf firſt by his iſſuing many prepoſterous edicts; but at length grew to ſuch a height, that he fancied himſelf a god, and found no fewer than 16,000 perſons who owned him as ſuch. Theſe were moſtly the Dararians, a new ſect ſprung up about this time, who were ſo called from their chief, Mohammed Ebn Iſhmael, ſurnamed Darari. He is ſuppoſed to have inſpired the mad khalif with this impious notion; and, as Darari ſet up for a ſecond Moſes, he did not ſcruple to aſſert that Al Hakem was the great Creator of the univerſe. For this reaſon, a zealous Turk ſtabbed him in the khalif's chariot. His death was followed by a three days uproar in the city of Cairo; during which, Darari's houſe was pulled down, and many of his followers maſſacred. The ſect, however, did not expire with its author. He left behind him a diſciple named Hamza, who, being encouraged by the mad khalif, ſpread it far and wide through his dominions. This was quickly followed by an abrogation of all the Mahommedan faſts, feſtivals, and pilgrimages, the grand one to Mecca in particular; ſo that the zealous Mahometans were now greatly alarmed, as juſtly ſuppoſing that Al Hakem deſigned entirely to ſuppreſs the worſhip of the true God, and introduce his own in its place. From this apprehenſion, however, they were delivered by the death of the khalif; who was aſſaſſinated, by a contrivance of his own ſiſter, in the year 1020.

Al Hakem was ſucceeded by his ſon Al Thaher, who reigned 15 years; and left the throne to a ſon under ſeven years of age, named Al Moſtanſer Billah.—In the year 1041, a revolt happened in Syria; but Al Moſtanſer having ſent a powerful army into that country, under the command of one *Anuſhtekin*, he not only reduced the rebels, but conſiderably enlarged the Egyptian dominions in Syria.

71
Al Moſtanſer attempts the conqueſt of Bagdad.

72
Khalif of Bagdad aſſiſted by Togrol Beg.

73
Bagdad taken.

In 1054, a Turk named Al Baſſaſiri, having quarrelled with the vizir Al Kayem khalif of Bagdad, fled to Egypt, and put himſelf under the protection of Al Moſtanſer. The latter, imagining this would be a favourable opportunity for enlarging his dominions, and perhaps ſeizing on the city of Bagdad, ſupplied Baſſaſiri with money and troops. By this aſſiſtance, he was enabled to poſſeſs himſelf of Arabian Irak, and ravaged that province to the very gates of Bagdad. On this, Al Kayem wrote to Togrol Beg, or Tangrolipix, the Turkiſh ſultan, who poſſeſſed very extenſive dominions in the eaſt, to come to his aſſiſtance. The ſultan immediately complied with his requeſt, and ſoon arrived at Bagdad with a formidable army and 18 elephants. Of this Baſſaſiri gave notice to Al Moſtanſer, and intreated him to exert himſelf further for his ſupport againſt ſo powerful an enemy. This was accordingly done, but nothing worthy of notice happened till the year 1058. At this time Baſſaſiri having found means to excite Ibrahim the ſultan's brother to a revolt, Togrol Beg was obliged to employ all his force againſt him. This gave Baſſaſiri an opportunity of ſeizing on the city of Bagdad itſelf; and the unfortunate khalif, according to ſome, was taken priſoner, or, according to others, fled out of the city. Baſſaſiri, on his entry, cauſed Al Moſtanſer to be immediately proclaimed khalif in all quarters of the city. Al Kayem's vizir he cauſed to be led on a camel through the ſtreets of Bagdad, dreſſed in a woollen gown, with a high red bonnet, and a leathern collar about his neck; a man laſhing him all the way behind. Then being ſewed up in a bull's hide, with the horns placed over his head, and hung upon hooks, he was beaten without ceaſing till he died. The imperial palace was plundered, and the khalif himſelf detained a cloſe priſoner.

74
The khalif reſtored.

This ſucceſs was but ſhort-lived; for, in 1059, Togrol Beg defeated his brother Ibrahim, took him priſoner, and ſtrangled him with a bow-ſtring. He then marched to Bagdad, which Baſſaſiri thought proper to abandon at his approach. Here the khalif Al Kayem was delivered up by Mahras, the governor of a city called *Haditha*, who had the charge of him. The khalif was immediately reſtored to his dignity; which Baſſaſiri no ſooner underſtood, than he again advanced towards the city. Againſt him Togrol Beg ſent a part of his army under ſome of his generals, while he himſelf followed with the reſt. A battle enſued, in which the army of Baſſaſiri was defeated, and he himſelf killed. His head was brought to Togrol Beg, who cauſed it to be carried on a pike through the ſtreets of Bagdad.

75
Decline of the Egyptian empire.

Thus the hopes of Al Moſtanſer were entirely fruſtrated; and from this period we may date the declenſion of the Egyptian empire under the khalifs. They had made themſelves maſters of almoſt all Syria; but no ſooner was Baſſaſiri's bad ſucceſs known, than the younger part of the citizens of Aleppo revolted, and ſet up Mahmud Azzo'dawla, who immediately laid ſiege to the citadel. Al Moſtanſer ſent a powerful army againſt him, which Azzo'dawla entirely defeated, and took the general himſelf priſoner; and ſoon after this, he made himſelf maſter both of the city and citadel, with all their dependencies. In his new dominions he behaved with the greateſt cruelty, deſtroying every thing with fire and ſword, and making frequent incurſions into the neighbouring provinces, which he treated in the ſame manner.

76
Terrible famine and plague.

This diſaſter was ſoon followed by others ſtill more terrible. In 1066, a famine raged over all Egypt and Syria, with ſuch fury, that dogs and cats were ſold for four or five Egyptian dinars each, and other proviſions in proportion. Multitudes of people died in Cairo for want of food. Nay, ſo great was the ſcarcity, that the vizir had but one ſervant left who was able to attend him to the khalif's palace, and to whom he gave the care of his horſe when he alighted at the gate. But, at his return, he was ſurpriſed to find that the horſe had been carried off, killed, and eaten by the famiſhed people. Of this he complained to the khalif; who cauſed three of them who had carried off the horſe to be hanged. Next day, however, he was ſtill more ſurpriſed to hear, that all the fleſh had been picked off the bones of the three unhappy criminals, ſo that nothing but the ſkeletons were left. And to ſuch a degree of miſery were the inhabitants, not only in Cairo but through all Egypt, reduced, that the carcaſes of thoſe who died were ſold for food at a great price, inſtead of being buried. All this time the khalif ſhowed the greateſt kindneſs and beneficence towards his unhappy ſubjects, inſomuch that of 10,000 horſes, mules, and camels, which he had in his ſtables when the famine began, he had only three left when it was removed.

77
Invaded by the Turks.

The famine was followed by a plague; and this by an invaſion of the Turks under Abu Ali Al Haſan Naſerod'dawla, the very general who had been ſent againſt the rebel Azzo'dawla and defeated by him. He began with beſieging the khalif in his own palace; and the unhappy prince, being in no condition to make reſiſtance, was obliged to buy himſelf off at the expence of every thing valuable that was left in his exhauſted capital and treaſury This, however, did not hinder theſe mercileſs plunderers from ravaging all the Lower Egypt from Cairo to Alexandria, and committing the moſt horrid cruelties through that whole tract.—This happened in the years 1067 and 1068; and in 1069 and 1070, there happened two other revolts in Syria: ſo that this country was now almoſt entirely loſt.

78 Jeruſalem taken.

In 1095 died the khalif Al Moſtanſer, having reigned 60 years; and was ſucceeded by his ſon Abul Kaſem, ſurnamed Al Moſtali.—The moſt remarkable tranſaction of this prince's reign, was his taking the city of Jeruſalem from the Turks in 1098: but this ſucceſs was only of ſhort duration; for it was, the ſame year, taken by the cruſaders.

79 A revolution in the kingdom.

From this time to the year 1164, the Egyptian hiſtory affords little elſe than an account of the inteſtine broils and conteſts between the vizirs or prime miniſters, who were now become ſo powerful, that they had in a great meaſure ſtripped the khalifs of their civil power, and left them nothing but a ſhadow of ſpiritual dignity. Theſe conteſts at laſt gave occaſion to a revolution, by which the race of Fatemite khalifs was totally extinguiſhed. This revolution was accompliſhed in the following manner.—One *Shawer*, having overcome all his competitors, became vizir to Al Aded, the eleventh khalif of Egypt. He had not been long in poſſeſſion of this office, when Al Dargam, an officer of rank, endeavoured to deprive him of it. Both parties quickly had recourſe to arms; and a battle enſued, in which Shawer was defeated, and obliged to fly to Nuroddin prince of Syria, by whom he was graciouſly received, and who promiſed to reinſtate him in his office of vizir. As an inducement to Nuroddin to aſſiſt him more powerfully, Shawer told him that the cruſaders had landed in Egypt, and made a conſiderable progreſs in the conqueſt of it. He promiſed alſo, that, in caſe he was reinſtated in his office, he would pay Nuroddin annually the third part of the revenues of Egypt; and would, beſides, defray the whole expence of the expedition.

As Nuroddin bore an implacable hatred to the Chriſtians, he readily undertook an expedition againſt them, for which he was to be ſo well paid. He therefore ſent an army into Egypt under the command of Shawer and a general named *Aſadoddin*. Dargam, in the mean time, had cut off ſo many generals whom he imagined favourable to Shawer's intereſt, that he thereby weakened the military force of the kingdom, and in a great meaſure deprived himſelf of the power of reſiſtance. He was therefore eaſily overthrown by Aſadoddin, and Shawer reinſtated in the office of vizir. The faithleſs miniſter, however, no ſooner ſaw himſelf firmly eſtabliſhed in his office, than he refuſed to fulfil his engagements to Nuroddin by paying the ſtipulated ſums. Upon this, Aſadoddin ſeized Peluſium and ſome other cities. Shawer then entered into an alliance with the cruſaders, and Aſadoddin was beſieged by their combined forces in Peluſium. Nuroddin, however, having invaded the Chriſtian dominions in Syria, and taken a ſtrong fortreſs called *Harem*, Shawer and his confederates thought proper to hearken to ſome terms of accommodation, and Aſadoddin was permitted to depart for Syria.

In the mean time, Nuroddin, having ſubdued the greateſt part of Syria and Meſopotamia, reſolved to make Shawer feel the weight of his reſentment, on account of his perfidious conduct. He therefore ſent back Aſadoddin into Egypt with a ſufficient force, to compel Shawer to fulfil his engagements: but this the vizir took care to do before the arrival of Aſadoddin; and thus, for the preſent, avoided the danger. It was not long, however, before he gave Nuroddin freſh occaſion to ſend this general againſt him. That prince had now driven the cruſaders almoſt entirely out of Syria, but was greatly alarmed at their progreſs in Egypt; and conſequently offended at the alliance which Shawer had concluded with them, and which he ſtill perſiſted in obſerving. This treaty was alſo thought to be contrived on purpoſe to prevent Shawer from being able to fulfil his promiſe to Nuroddin, of ſending him annually a third of the revenues of Egypt. Nuroddin therefore again diſpatched Aſadoddin into Egypt, in the year 1166, with a ſufficient force, and attended by the famous Salahaddin, or Saladin, his own nephew. They entered the kingdom without oppoſition, and totally defeated Shawer and the cruſaders. They next made themſelves maſters of Alexandria; and, after that, over-ran all the Upper Egypt. Saladin was left with a conſiderable garriſon in Alexandria; but Aſadoddin was no ſooner gone, than the cruſaders laid ſiege to that city. This at laſt obliged Aſadoddin to return to its relief. The great loſſes he had ſuſtained in this expedition probably occaſioned his agreeing to a treaty with Shawer, by which he engaged to retire out of Egypt, upon being paid a ſum of money.

Aſadoddin was no ſooner gone, than Shawer entered into a freſh treaty with the Franks. By this new alliance he was to attack Nuroddin in his own dominions, as he was at that time engaged in quelling ſome revolters, which would effectually prevent his ſending any more forces into Egypt. This treaty ſo provoked the Syrian prince, that he reſolved to ſuſpend his other conqueſts for ſome time, and exert his whole ſtrength in the conqueſt of Egypt.

80 Conqueſts of the cruſaders.

By this time the cruſaders had reduced Peluſium, and made a conſiderable progreſs in the kingdom, as well as in ſome other countries, through the diviſions which reigned among the Mahometan princes. In ſuch places as they conquered, they put almoſt every body to the ſword, Chriſtians as well as Mahometans; ſelling their priſoners for ſlaves, and giving up the towns to be plundered by the ſoldiers. From Peluſium they marched to Cairo; which was then in no poſture of defence, and in the utmoſt confuſion, by reaſon of the diviſions which reigned in it. Shawer, therefore, as ſoon as he heard of their approach, cauſed the ancient quarter called *Meſr* to be ſet on fire, and the inhabitants to retire into the other parts. He alſo prevailed upon the khalif to ſolicit the aſſiſtance of Nuroddin; which the latter was indeed pretty much inclined of himſelf to grant, as it gave him the faireſt opportunity he could have wiſhed for, both of driving the cruſaders out of Egypt, and of ſeizing the kingdom to himſelf. For this purpoſe he had already raiſed an army of 60,000 horſe under his general Aſadoddin; and, on the receipt of Al Aded's meſſage, gave them orders to ſet out immediately. The cruſaders were now arrived at Cairo; and had ſo cloſely beſieged that place, that neither Shawer nor the khalif knew any thing of the approach of the Moſlem army which was haſtening to their relief. The vizir, therefore, finding it impoſſible to hold out long againſt the enemy, had recourſe to his old ſubterfuge of treaties and high promiſes. He ſent the enemy 100,000 dinars, and promiſed them 900,000 more, if they would raiſe the ſiege; which they, dreading the approach of Aſadoddin, very readily accepted.

81 They are repulſed by the army of Nuroddin prince of Damaſcus.

The army of Nuroddin now approached the capital by haſty marches, and were every where received with the greateſt demonſtrations of joy. Aſadoddin, on his arrival at Cairo, was invited by Al Aden to the royal palace, where he was entertained in the moſt magnificent manner, and received ſeveral preſents; nor were Saladin and the other principal officers leſs magnificently treated. Shawer alſo, conſcious of his perfidious conduct, was no leſs aſſiduous in attending punctually upon him. But having invited the general and ſome others to an entertainment, he had formed a ſcheme of having them ſeized and murdered. The plot, however, being diſcovered, Shawer himſelf had his head cut off, and Aſadoddin was made vizir in his ſtead. He did not, however, long enjoy his new dignity; for he died two months and five days after his inſtalment, being ſucceeded in his office of vizir by his nephew Saladin.

82 Saladin becomes vizir of Egypt.

The new vizir was the youngeſt of all the grandees who aſpired to that office, but had already given ſome ſignal proofs of his valour and conduct. What determined the khalif to prefer him to all the reſt is not known; but it is certain that ſome of them were highly diſpleaſed with his promotion, and even publicly declared that they would not obey him. In order to gain theſe to his intereſt, therefore, Saladin found it neceſſary to diſtribute among them part of the vaſt treaſures left by his uncle; by which means he ſoon governed Egypt without controul, as had been cuſtomary with the vizirs for ſome time before. Soon after his being inſtalled into the office of vizir, he gave a total defeat to the negroes who guarded the royal palace, and had oppoſed his election; by which means, and a ſtrong garriſon he had placed in the caſtle of Cairo, his power became firmly eſtabliſhed. Though he had not the leaſt intention of continuing in his allegiance to Nuroddin, he did not think it prudent at firſt to declare himſelf. He ſent for his father, however, and the reſt of his family, who were in Nuroddin's dominions, in order, as he ſaid, to make them partakers of his grandeur and happineſs. Nuroddin did not think proper to deny this requeſt; though, being already jealous of the great power of Saladin, he inſiſted that his family ſhould conſider him only as one of his generals in Egypt.

A good underſtanding ſubſiſted between Nuroddin and Saladin for ſome time, which did not a little contribute to raiſe the credit of the latter with the Egyptians. In 1169, Nuroddin ſent him orders to omit the name of Al Aded, the khalif of Egypt, in the public prayers, and ſubſtitute that of the khalif of Bagdad in its place. This was at any rate a dangerous attempt; as it might very readily produce a revolt in favour of Al Aded; or if it did not, it gave Saladin an opportunity of engroſſing even that ſmall remnant of power which was left to the khalif. Al Aded, however, was not ſenſible of his diſgrace; for he was on his death-bed, and paſt recovery, when Nuroddin's orders were executed. After his death, Saladin ſeized on all his wealth and valuable effects; which conſiſted of jewels of prodigious ſize, ſumptuous furniture, a library containing 100,000 volumes, &c. His family he cauſed to be cloſely confined in the moſt private and retired part of the palace; and either manumitted his ſlaves, or kept them for himſelf, or diſpoſed of them to others.

83 Seizes the effects of the khalif.

Saladin was now arrived at the higheſt pitch of wealth, power, and grandeur. He was, however, obliged to behave with great circumſpection with regard to Nuroddin; who ſtill continued to treat him as his vaſſal, and would not ſuffer him to diſpute the leaſt of his commands. He relied for advice chiefly on his father Ayub; who was a conſummate politician, and very ambitious of ſeeing his ſon raiſed to the throne of Egypt. He therefore adviſed Saladin to continue ſtedfaſt in his reſolutions; and, whilſt he amuſed Nuroddin with feigned ſubmiſſions, to take every method in his power to ſecure himſelf in the poſſeſſion of ſo valuable a kingdom. Nuroddin himſelf, however, was too great a maſter in the art of diſſimulation to be eaſily impoſed on by others; and therefore, though he pretended to be well pleaſed with Saladin's conduct, he was all this time raiſing a powerful army, with which he was fully determined to invade Egypt the following year. But while he meditated this expedition, he was ſeized with a quinſy at the caſtle of Damaſcus, which put an end to his life, in the year 1173.

84 Aſpires to the crown.

Saladin, though now freed from the apprehenſions of ſuch a formidable enemy, dared not venture to aſſume the title of *Sovereign*, while he ſaw the ſucceſſor of Nuroddin at the head of a very powerful army, and no leſs deſirous than able to diſpoſſeſs him. For this reaſon his firſt care was to ſecure to himſelf an aſylum, in caſe he ſhould be obliged to leave Egypt altogether. For this purpoſe he choſe the kingdom of Nubia; but having diſpatched his brother Malek Turanſhah thither, at the head of a conſiderable army, the latter was ſo much ſtruck with the ſterility and deſolate appearance of the country, that he returned without attempting any thing. Saladin then ſent his brother into Arabia Felix, in order to ſubdue that country, which had been for ſome time held by Abdalnabi an Arabian prince. Malek entered the country without oppoſition; and having brought Abdalnabi to a general action, entirely defeated him, took him priſoner, and threw him into irons. He then over-ran and reduced under ſubjection to Saladin great part of the country, taking no fewer than 80 caſtles or fortreſſes of conſiderable ſtrength.

85 Subdues Arabia Felix.

After this good fortune, Saladin, now ſure of a convenient place of refuge in caſe of any misfortune, aſſumed the title of *Sultan* or ſovereign of Egypt; and was acknowledged as ſuch by the greater part of the ſtates. The zeal of the Egyptians for the Fatemite khalifs, however, ſoon produced a rebellion. One *Al Kanz*, or *Kanzanaddowla*, governor of a city in Upper Egypt, aſſembled a great army of blacks, or rather

86 Aſſumes the title of ſultan.

ſwarthy natives; and marching directly into the lower country, was there joined by great numbers of other Egyptians. Againſt them Saladin diſpatched his brother Malek, who ſoon defeated and entirely diſperſed them. This, however, did not prevent another inſurrection under an impoſtor, who pretended to be David the ſon of Al Aden the laſt Fatemite khalif, and had collected a body of 100,000 men. But before theſe had time to do any great damage, they were ſurpriſed by the ſultan's forces, and entirely defeated. Above 300 were publicly hanged, and a vaſt number periſhed in the field, inſomuch that it was thought ſcarce a fourth part of the whole body eſcaped.

About this time Saladin gained a conſiderable advantage over the cruſaders, commanded by William II. king of Sicily. That prince had invaded Egypt with a numerous fleet and army, with which he laid cloſe ſiege to Alexandria both by ſea and land. Saladin, however, marched to the relief of the city with ſuch ſurpriſing expedition, that the cruſaders were ſeized with a ſudden panic, and fled with the utmoſt precipitation, leaving all their military engines, ſtores, and baggage behind.

87
Saladin made ſovereign of Damaſcus.

In the year 1175, the inhabitants of Damaſcus begged of Saladin to accept the ſovereignty of that city and its dependencies; being jealous of the miniſter, who had the tuition of the reigning prince, and who governed all with an abſolute ſway. The application was no ſooner made, than the ſultan ſet out with the utmoſt celerity to Damaſcus, at the head of a choſen detachment of 700 horſe. Having ſettled his affairs in that city, he appointed his brother Saif Al Iſlam governor of it; and ſet out for Hems, to which he immediately laid ſiege. Having made himſelf maſter of this place, he then proceeded to Hamah. The city very ſoon ſurrendered, but the citadel held out for ſome time. Saladin pretended that he accepted the ſovereignty of Damaſcus and the other places he had conquered, only as deputy to Al Malec Al Saleh, the ſucceſſor of Nuroddin, and who was then under age; and that he was deſirous of ſending Azzoddin, who commanded in the citadel, with a letter to Aleppo, where the young prince reſided. This ſo pleaſed Azzoddin, that he took the oath of fidelity to Saladin, and immediately ſet out with the ſultan's letter. He had not, however, been long at Aleppo before he was by the miniſter's orders thrown into priſon; upon which his brother, who had been appointed governor of the citadel Hamah in his abſence, delivered it up to Saladin without further ceremony. The ſultan then marched to Aleppo, with a deſign to reduce it; but, being vigorouſly repulſed in ſeveral attacks, he was at laſt obliged to abandon the enterpriſe. At the ſame time, Kamſchlegin, Al Malek's miniſter or vizir, hired the chief of the Bataniſts, or Aſſaſſins *, to murder him. Several attempts were made in conſequence of this application; but all of them, happily for Saladin, miſcarried.

After raiſing the ſiege of Aleppo, Saladin returned to Hems, which place the cruſaders had inveſted. On his approach, however, they thought proper to retire; after which, the ſultan made himſelf maſter of the ſtrong caſtle belonging to that place, which, before, he had not been able to reduce. This was ſoon followed by the reduction of Baalbec; and theſe rapid conqueſts ſo alarmed the miniſters of Al Malek, that, entering into a combination with ſome of the neighbouring princes, they raiſed a formidable army, with which they deſigned to cruſh the ſultan at once. Saladin, fearing the event of a war, offered to cede Hems and Hamah to Al Malek, and to govern Damaſcus only as his lieutenant: but theſe terms being rejected, a battle enſued; in which the allied army was utterly defeated, and the ſhattered remains of it ſhut up in the city of Aleppo. This produced a treaty, by which Saladin was left maſter of all Syria, excepting only the city of Aleppo and the territory belonging to it.

88
Defeats his enemies.

89
Receives a terrible overthrow from the cruſaders.

In 1176 Saladin returned from the conqueſt of Syria, and made his triumphal entry into Cairo. Here, having reſted himſelf and his troops for ſome time, he began to encompaſs the city with a wall 29,000 cubits in length, but which he did not live to finiſh. Next year he led a very numerous army into Paleſtine againſt the cruſaders. But here his uſual good fortune failed him. His army was entirely defeated. Forty thouſand of his men were left dead on the field; and the reſt fled with ſo much precipitation, that, having no towns in the neighbourhood where they could ſhelter themſelves, they traverſed the vaſt deſart between Paleſtine and Egypt, and ſcarce ſtopped till they reached the capital itſelf. The greateſt part of the army by this means periſhed; and as no water was to be had in the deſart above mentioned, almoſt all the beaſts died of thirſt before the fugitives arrived on the confines of Egypt. Saladin himſelf ſeemed to have been greatly intimidated; for in a letter to his brother Al Malek, he told him, that "he was more than once in the moſt imminent danger; and that God, as he apprehended, had delivered him from thence, in order to reſerve him for the execution of ſome grand and important deſign."

In the year 1182, the ſultan ſet out on an expedition to Syria with a formidable army, amidſt the acclamations and good wiſhes of the people. He was, however, repulſed with loſs both before Aleppo and Al Mawſel, after having ſpent much time and labour in beſieging theſe two important places.

90
The Chriſtians receive a great defeat at ſea.

In the mean time, a moſt powerful fleet of European ſhips appeared on the Red Sea, which threatened the cities of Mecca and Medina with the utmoſt danger. The news of this armament no ſooner reached Cairo, than Abu Becr, Saladin's brother, who had been left viceroy in the ſultan's abſence, cauſed another to be fitted out with all ſpeed under the command of Lulu, a brave and experienced officer; who quickly came up with them, and a dreadful engagement enſued. The Chriſtians were defeated after an obſtinate reſiſtance, and all the priſoners butchered in cold blood. This proved ſuch a terrible blow to the Europeans, that they never more ventured on a like attempt.

91
Saladin's rapid conqueſts.

In 1183, Saladin continued to extend his conqueſts. The city of Amida in Meſopotamia ſurrendered to him in eight days; after which, being provoked by ſome violences committed by the prince of Aleppo, he reſolved at all events to make himſelf maſter of that place. He was now attended with better ſucceſs than formerly; for as his army was very numerous, and he puſhed on the ſiege with the utmoſt vigour, Amadoddin the prince capitulated, upon condition of being allowed to poſſeſs certain cities in Meſopotamia which

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* See Aſſaſſin.

had formerly belonged to him, and being ready to attend the ſultan on whatever expedition he pleaſed. After the conqueſt of Aleppo, Saladin took three other cities, and then marched againſt his old enemies the cruſaders. Having ſent out a party to reconnoitre the enemy, they fell in with a conſiderable detachment of Chriſtians; whom they eaſily defeated, taking about 100 priſoners, with the loſs of only a ſingle man on their ſide. The ſultan, animated by this firſt inſtance of ſucceſs, drew up his forces in order of battle, and advanced againſt the cruſaders, who had aſſembled their whole army at Sepphoris in Galilee. On viewing the ſultan's troops, however, and perceiving them to be greatly ſuperior in ſtrength to what they had at firſt apprehended, they thought proper to decline an engagement, nor could Saladin with all his ſkill force them to it. But though it was found impoſſible to bring the cruſaders to a deciſive engagement, Saladin found means to haraſs them greatly, and deſtroyed great numbers of their men. He carried off alſo many priſoners, diſmantled three of their ſtrongeſt cities, laid waſte their territories, and concluded the campaign with taking another ſtrong town.

92 Chriſtians totally defeated.

For three years Saladin continued to gain ground on the cruſaders, yet without any deciſive advantage; but in 1187, the fortune of war was remarkably unfavourable to them. The Chriſtians now found themſelves obliged to venture a battle, by reaſon of the cruel ravages committed in their territories by Saladin, and by reaſon of the encroachments he daily made on them. Both armies therefore being reſolved to exert their utmoſt efforts, a moſt fierce and bloody battle enſued. Night prevented victory from declaring on either ſide, and the fight was renewed with equal obſtinacy next day. The victory was ſtill left undecided; but the third day the ſultan's men finding themſelves ſurrounded by the enemy on all ſides but one, and there alſo hemmed in by the river Jordan, ſo that there was no room to fly, fought like men in deſpair, and at laſt gained a moſt complete victory. Vaſt numbers of the Chriſtians periſhed on the field. A large body found means to retire in ſafety to the top of a neighbouring hill covered with wood; but being ſurrounded by Saladin's troops, who ſet fire to the wood, they were all obliged to ſurrender at diſcretion. Some of them were butchered by their enemies as ſoon as they delivered themſelves into their hands, and others thrown into irons. Among the latter were the king of Jeruſalem himſelf, Arnold prince of Al Shawbec and Al Carac, the maſters of the Templars and Hoſpitalers, with almoſt the whole body of the latter. So great was the conſternation of the Chriſtians on this occaſion, that one of Saladin's men is ſaid to have taken 30 of them priſoners, and tied them together with the cord of his tent, to prevent them from making their eſcape. The maſters of the Templars and Hoſpitalers, with the knights acting under them, were no ſooner brought into Saladin's preſence, than he ordered them all to be cut in pieces. He called them *Aſſaſſins* or *Bataniſts*; and had been wont to pay 50 dinars for the head of every Templar or Hoſpitaler that was brought him. After the engagement, Saladin ſeated himſelf in a magnificent tent, placing the king of Jeruſalem on his right hand, and Arnold prince of Al Shawbec and Al Carac on his left. Then he drank to the former, who was at that time ready to expire with thirſt, and at the ſame time offered him a cup of ſnow-water. This was thankfully received; and the king immediately drank to the prince of Al Carac, who ſat near him. But here Saladin interrupted him with ſome warmth: "I will not (ſays he) ſuffer this curſed rogue to drink; as that, according to the laudable and generous cuſtom of the Arabs, would ſecure to him his life." Then, turning towards the prince, he reproached him with having undertaken the expedition while in alliance with himſelf, with having intercepted an Egyptian caravan in the time of profound peace, and maſſacring the people of which it was compoſed, &c. Notwithſtanding all this, he told him, he would grant him his life, if he would embrace Mahometaniſm. This condition, however, was refuſed; and the ſultan, with one ſtroke of his ſcimeter, cut off the prince's head. This greatly terrified the king of Jeruſalem; but Saladin aſſured him he had nothing to fear, and that Arnold had brought on himſelf a violent death by his want of common honeſty.

93 His further conqueſts.

The cruſaders being thus totally defeated and diſperſed, Saladin next laid ſiege to Tiberias, which capitulated in a ſhort time. From thence he marched towards Acca or Ptolemais, which likewiſe ſurrendered after a ſhort ſiege. Here he found 4000 Mahometan priſoners in chains, whom he immediately releaſed. As the inhabitants enjoyed at preſent a very extenſive trade, the place being full of merchants, he found there not only vaſt ſums of money, but likewiſe a great variety of wares exceedingly valuable, all which he ſeized and applied to his own uſe. About the ſame time his brother Al Malec attacked and took a very ſtrong fortreſs in the neighbourhood; after which the ſultan divided his army into three bodies, that he might with the greater facility over-run the territories of the Chriſtians. Thus, in a very ſhort time, he made himſelf maſter of Neapolis, Cæſarea, Sepphoris, and other cities in the neighbourhood of Ptolemais, where his ſoldiers found only women and children, the men having been all killed or taken priſoners. His next conqueſt was Joppa, which was taken by ſtorm after a vigorous reſiſtance. Every thing being then ſettled, and a diſtribution made of the ſpoils and captives, Saladin marched in perſon againſt Tebrien, a ſtrong fortreſs in the neighbourhood of Sidon; which was taken by aſſault, after it had ſuſtained a ſiege of ſix days. No ſooner was he maſter of this place, than he ordered the fortreſs to be razed, and the garriſon put to the ſword. From Tebrien the victorious ſultan proceeded to Sidon itſelf; which, being deſerted by its prince, ſurrendered almoſt on the firſt ſummons. Berytus was next inveſted, and ſurrendered in ſeven days. Among the priſoners Saladin found in this place the prince of a territory called *Hobeil*, who by way of ranſom delivered up his dominions to him, and was of conſequence releaſed. About the ſame time, a Chriſtian ſhip, in which was a nobleman of great courage and experience in war, arrived at the harbour of Ptolemais, not knowing that it was in the hands of Saladin. The governor might eaſily have ſecured the veſſel; but neglecting the opportunity, ſhe eſcaped to Tyre, where the above mentioned nobleman, together with the prince of Hobeil, contributed not a little to retrieve the affairs of the Chriſtians, and enable them to make a ſtand for four years after.

94 Jeruſalem taken.

Saladin in the mean time went on with his conqueſts. Having made himſelf maſter of Aſcalon after a ſiege of 14 days, he next inveſted Jeruſalem. The garriſon was numerous, and made an obſtinate defence; but Saladin having at laſt made a breach in the walls by ſapping, the beſieged deſired to capitulate. This was at firſt refuſed; upon which the Chriſtian ambaſſador made the following ſpeech: "If that be the caſe, know, O ſultan, that we who are extremely numerous, and have been reſtrained from fighting like men in deſpair only by the hopes of an honourable capitulation, will kill all our wives and children, commit all our wealth and valuable effects to the flames, maſſacre 5000 priſoners now in our hands, leave not a ſingle beaſt of burden or animal of any kind belonging to us alive, and level with the ground the rock you eſteem ſacred, together with the temple Al Akſa. After this we will ſally out upon you in a body; and doubt not but we ſhall either cut to pieces a much greater number of you than we are, or force you to abandon the ſiege." This deſperate ſpeech had ſuch an effect upon Saladin, that he immediately called a council of war, at which all the general officers declared, that it would be moſt proper to allow the Chriſtians to depart unmoleſted. The ſultan therefore allowed them to march out freely and ſecurely with their wives, children, and effects; after which he received ten dinars from every man capable of paying that ſum, five from every woman, and two from every young perſon under age. For the poor who were not able to pay any thing, the reſt of the inhabitants raiſed the ſum of 30,000 dinars.

Moſt of the inhabitants of Jeruſalem were eſcorted by a detachment of Saladin's troops to Tyre; and ſoon after, he advanced with his army againſt that place. As the port was blocked up by a ſquadron of five men of war, Saladin imagined that he ſhould eaſily become maſter of it. But in this he found himſelf miſtaken. For, one morning by break of day, a Chriſtian fleet fell upon his ſquadron, and entirely defeated it; nor did a ſingle veſſel eſcape their purſuit. A conſiderable number of the Mahometans threw themſelves into the ſea during the engagement; moſt of whom were drowned, though ſome few eſcaped. About the ſame time Saladin himſelf was vigorouſly repulſed by land; ſo that, after calling a council of war, it was thought proper to raiſe the ſiege.

In 1188, Saladin, though his conqueſts were not ſo rapid and conſiderable as hitherto, continued ſtill ſuperior to his enemies. He reduced the city of Laodicea and ſome others, together with many ſtrong caſtles; but met alſo with ſeveral repulſes. At laſt he took the road to Antioch; and having reduced all the fortreſſes that lay in his way, many of which had been deemed impregnable, Bohemond prince of Antioch was ſo much intimidated, that he deſired a truce for ſeven or eight months. This Saladin found himſelf obliged to comply with, on account of the prodigious fatigues his men had ſuſtained, and becauſe his auxiliaries now demanded leave to return home.

95 Cruſaders retrieve their affairs.

All theſe heavy loſſes of the Chriſtians, however, proved in ſome reſpects an advantage, as they were thus obliged to lay aſide their animoſities, which had originally proved the ruin of their affairs. Thoſe who had defended Jeruſalem, and moſt of the other fortreſſes taken by Saladin, having retreated to Tyre, formed there a very numerous body. This proved the means of preſerving that city, and alſo of re-eſtabliſhing their affairs for the preſent. For, having received powerful ſuccours from Europe, they were enabled in 1189 to take the field with 30,000 foot and 2000 horſe. Their firſt attempt was upon Alexandretta; from whence they diſlodged a ſtrong party of Mahometans, and made themſelves maſters of the place with very little loſs. They next laid ſiege to Ptolemais; of which Saladin had no ſooner received intelligence, than he marched to the relief of the place. After ſeveral ſkirmiſhes with various ſucceſs, a general engagement enſued, in which Saladin was defeated with the loſs of 10,000 men. This enabled the Chriſtians to carry on the ſiege of Ptolemais with greater vigour; which place, however, they were not able to reduce for the ſpace of two years.

This year the ſultan was greatly alarmed by an account that the emperor of Germany was advancing to Conſtantinople with an army of 260,000 men, in order to aſſiſt the other cruſaders. This prodigious armament, however, came to nothing. The multitude was ſo reduced with ſickneſs, famine, and fatigue, that ſcarce 1000 of them reached the camp before Ptolemais. The ſiege of that city was continued, though with bad ſucceſs on the part of the Chriſtians. They were repulſed in all their attacks, their engines were burnt with naphtha, and the beſieged always received ſupplies of proviſions in ſpite of the utmoſt efforts of the beſiegers; at the ſame time that a dreadful famine and peſtilence raged in the Chriſtian camp, which ſometimes carried of 200 people a-day.

96 Richard I. of England arrives in Aſia.

In 1191, the Chriſtians received powerful ſuccours from Europe. Philip II. of France, and Richard I. of England (from his great courage ſurnamed *Cœur de Lion*), arrived before the camp at Ptolemais. The latter was eſteemed the braveſt and moſt enterprizing of all the generals the cruſaders had; and the ſpirits of his ſoldiers were greatly elated by the thoughts of acting under ſuch an experienced commander. Soon after his arrival, the Engliſh ſunk a Mahometan ſhip of vaſt ſize, having on board 650 ſoldiers, a great quantity of arms and proviſions, going from Berytus to Ptolemais. Of the ſoldiers and ſailors who navigated this veſſel, only a ſingle perſon eſcaped; who being taken priſoner by the Engliſh, was diſpatched to the ſultan with the news of the diſaſter. The beſieged ſtill defended themſelves with the greateſt reſolution; and the king of England happening to fall ſick, the operations of the beſiegers were conſiderably delayed. On his recovery, however, the attacks were renewed with ſuch fury, that the place was every moment in danger of being taken by aſſault. This induced them to ſend a letter to Saladin, informing him, that if they did not receive ſuccours the very next day, they would be obliged to ſubmit. As this town was the ſultan's principal magazine of arms, he was greatly affected with the account of their diſtreſs, eſpecially as he found it impoſſible to relieve them. The inhabitants, therefore, found themſelves under a neceſſity of ſurrendering the place. One of the terms of the capitulation was, that the cruſaders ſhould receive a very conſiderable ſum of money from Saladin, in conſequence of their delivering up the Mahometan priſoners they had in their hands. This article Saladin refuſed to comply with; and in conſequence of his refuſal, Richard cauſed 3000 of thoſe unfortunate men to be ſlaughtered at once.

97 Defeats Saladin.

After the reduction of Ptolemais, the king of England, now made generaliſſimo of the cruſaders, took the road to Aſcalon, in order to beſiege that place; after which, he intended to make an attempt upon Jeruſalem itſelf. Saladin propoſed to intercept his paſſage, and placed himſelf in the way with an army of 300,000 men. On this occaſion was fought one of the greateſt battles of that age. Saladin was totally defeated, with the loſs of 40,000 men; and Aſcalon ſoon fell into the hands of the cruſaders. Other ſieges were afterwards carried on with ſucceſs, and Richard even approached within ſight of Jeruſalem, when he found, that, by reaſon of the weakened ſtate of his army, and the diviſions which prevailed among the officers who commanded it, he ſhould be under the neceſſity of concluding a truce with the ſultan. This was accordingly done in the year 1192; the term was, three years, three months, three weeks, three days, and three hours; ſoon after which the king of England ſet out on his return to his own dominions.

98 Mamlouks become maſters of Egypt.

99 Account of them.

In 1193 Saladin died, to the inexpreſſible grief of all true Mahometans, who held him in the utmoſt veneration. His dominions in Syria and Paleſtine were ſhared out among his children and relations into many petty principalities. His ſon Othman ſucceeded to the crown of Egypt; but as none of his ſucceſſors poſſeſſed the enterpriſing genius of Saladin, the hiſtory from that time to the year 1250 affords nothing remarkable. At this time the reigning ſultan Malek Al Salek was dethroned and ſlain by the *Mamelucs* or *Mamlouks*, as they are called, a kind of mercenary ſoldiers who ſerved under him. In conſequence of this revolution, the Mameluces became maſters of Egypt, and choſe a ſultan from among themſelves.—Theſe Mamlouks are thought to have been young Turks or Tartars, ſold to private perſons by the merchants, from whom they were bought by the ſultan, educated at his expence, and employed to defend the maritime places of the kingdom. The reaſon of this inſtitution originally was, that the native Egyptians were become ſo cowardly, treacherous, and effeminate, from a long courſe of ſlavery, that they were unfit for arms. The Mamlouks, on the contrary, made moſt excellent ſoldiers; for having no friends but among their own corps, they turned all their thoughts to their own profeſſion. According to M. Volney, they came originally from Mount Caucaſus, and are diſtinguiſhed by the flaxen colour of their hair. Here they were found by the cruſaders, and were by them called *Mamelucs*, or more correctly *Mamlouks* The expedition of the Tartars in 1227 proved indirectly the means of introducing them into Egypt. Theſe horrible conquerors, having ſlaughtered and maſſacred till they were weary, brought along with them an immenſe number of ſlaves of both ſexes, with whom they filled all the markets in Aſia. The Turks, taking advantage of the opportunity, purchaſed about 12,000 young men, whom they bred up in the profeſſion of arms, in which they ſoon attained to great perfection; but becoming mutinous, like the Roman pretorian bands, they turned their arms againſt their maſters, and in 1250 depoſed and murdered the khalif, as has been already related.

100 Driven out by the Borgites.

The Mamlouks having got poſſeſſion of the government, and neither underſtanding nor putting a value upon any thing beſides the art of war, every ſpecies of learning decayed in Egypt, and a great degree of barbariſm was introduced. Neither was their empire of long duration notwithſtanding all their martial abilities. The reaſon of this was, that they were originally only a ſmall part of the ſultan of Egypt's ſtanding forces. As a numerous ſtanding army was neceſſary in a country where the fundamental maxim of government was, that every native muſt be a ſlave, they were at firſt at a loſs how to act; being juſtly ſuſpicious of all the reſt of the army. At laſt they reſolved to buy Chriſtian ſlaves, and educate them in the ſame way that they themſelves had formerly been. Theſe were commonly brought from Circaſſia, where the people, though they profeſſed Chriſtianity, made no ſcruple of ſelling their children. When they were completed in their military education, theſe ſoldiers were diſpoſed of through all the fortreſſes erected in the country to bridle the inhabitants; and becauſe in their language ſuch a fort was called *Borge*, the new militia obtained the name of *Borgites*. By this expedient the Mamlouks imagined they would be able to ſecure themſelves in the ſovereignty. But in this they were miſtaken. In proceſs of time, the old Mamlouks grew proud, inſolent, and lazy: and the Borgites, taking advantage of this, roſe upon their maſters, deprived them of the government, and transferred it to themſelves about the year 1382.

101 Egypt conquered by Selim.

The Borgites, as well as the former, aſſumed the name of *Mamlouks;* and were famous for their valour and ferocity of conduct. They were almoſt perpetually engaged in wars either foreign or domeſtic; and their dominion laſted till the year 1517, when they were invaded by Selim the Turkiſh ſultan. The Mamlouks defended themſelves with incredible valour; notwithſtanding which, being overpowered by numbers, they were defeated in every engagement. The ſame year, their capital, the city of Cairo, was taken, with a terrible ſlaughter of thoſe who defended it. The ſultan was forced to fly; and, having collected all his force, ventured a deciſive battle. The moſt romantic efforts of valour, however, were inſufficient to cope with the innumerable multitude which compoſed the Turkiſh army. Moſt of his men were cut in pieces, and the unhappy prince himſelf was at laſt obliged to take ſhelter in a marſh. He was dragged from his hiding place, where he had ſtood up to the ſhoulders in water, and ſoon after put to death. With him ended the glory, and almoſt the exiſtence, of the Mamlouks, who were now every where ſearched for and cut in pieces.

This was the laſt great revolution in the Egyptian affairs; a revolution very little to the advantage of the natives, who may well doubt whether their ancient or modern conquerors have behaved with the greater degree of barbarity. Selim gave a ſpecimen of his government, the very day after his being put in full poſſeſſion of it by the death of Tuman Bey the unfortunate ſultan above mentioned. Having ordered a theatre to be erected with a throne upon it on the banks of the

Nile, he cauſed all the priſoners, upwards of 30,000 in number, to be beheaded in his preſence, and their bodies thrown into the river.

102
His horrid cruelty.

103
New form of government introduced by Selim.

104
His edict for a republic.

Notwithſtanding this horrid cruelty of Selim, he did not attempt the total extermination of the race of Mamlouks, though this would have been quite agreeable to the maxims of Turkiſh policy; but in the preſent caſe he ſeems to have recollected, that if he eſtabliſhed a pacha in Egypt with the ſame powers with which he inveſted thoſe of other parts, he would be under ſtrong temptations to revolt by reaſon of the diſtance from the capital. He therefore propoſed a new form of government, by which the power being diſtributed among the different members of the ſtate, ſhould preſerve an equilibrium, ſo that the dependence of the whole ſhould be upon himſelf. With this view, he choſe from among the Mamlouks who had eſcaped the general maſſacre, a divan, or council of regency, conſiſting of the pacha and chiefs of the ſeven military corps. The former was to notify to this council the orders of the Porte, to ſend the tribute to Conſtantinople, and provide for the ſafety of government both external and internal; while, on the other hand, the members of the council had a right to reject the orders of the pacha, or even of depoſing him, provided they could aſſign ſufficient reaſons. All civil and political ordinances muſt alſo be ratified by them. Beſides this, he formed the whole body into a republic; for which purpoſe he iſſued an edict to the following purpoſe: "Though, by the help of the Almighty, we have conquered the whole kingdom of Egypt with our invincible armies; nevertheleſs our benevolence is willing to grant to the 24 ſangiacs (A) of Egypt a republican government, with the following conditions.

"I. That our ſovereignty ſhall be acknowledged by the republic; and in token of their obedience, our lieutenant ſhall be received as our repreſentative: but to do nothing againſt our will or the republic; but, on the contrary, ſhall co-operate with it for its welfare on all occaſions. Or if he ſhall attempt to infringe any of its privileges, the republic is at liberty to ſuſpend him from his authority, and to ſend to our Sublime Porte a complaint againſt him, &c.

"II. In time of war, the republic ſhall provide 12,000 troops at its own expence, to be commanded by a ſangiac or ſangiacs.

"III. The republic ſhall raiſe annually and ſend to our Sublime Porte the ſum of 560,000 aſlany (B), accompanied by a ſangiac, who ſhall have a ſatisfactory receipt, &c.

"IV. The ſame ſum to be raiſed for the uſe of Medina, and Kiabe or Mecca.

"V. No more troops or janizaries ſhall be kept by the republic in time of peace than 14,000; but in time of war they may be increaſed to oppoſe our and the republic's enemies.

"VI. The republic ſhall ſend annually to our granary, out of the produce of the country, one million of caſiz (C) or meaſures of corn, *viz.* 600,000 of wheat and 400,000 of barley.

"VII. The republic, fulfilling theſe articles, ſhall have a free government over all the inhabitants of Egypt, independent of our lieutenant; but ſhall execute the laws of the country with the advice of the mollah or high prieſt under our authority and that of our ſucceſſors.

"VIII. The republic ſhall be in poſſeſſion of the mint as heretofore; but with this condition, that it ſhall be under the inſpection of our lieutenant, that the coin may not be adulterated.

"IX. That the republic ſhall elect a *ſheik bellet* out of the number of beys, to be confirmed by our lieutenant; and that the ſaid ſheik bellet ſhall be our repreſentative, and ſhall be eſteemed by all our lieutenants, and all our officers both of high and low rank, as the head of the republic; and if our lieutenant is guilty of oppreſſion, or exceeds the bounds of his authority, the ſaid ſheik bellet ſhall repreſent the grievances of the republic to our Sublime Porte: but in caſe any foreign enemy or enemies diſturb the peace of the republic, we and our ſucceſſors engage to protect it with our utmoſt power until peace is re-eſtabliſhed, without any coſt or expence to the republic.

"Given and ſigned by our *clemency* to the republic of Egypt."

105
The Turkiſh power now almoſt entirely loſt.

106
Why the children of the Mamlouks and Turks all die in Egypt.

Thus the power of the Mamlouks ſtill continued in a very conſiderable degree, and by degrees increaſed ſo much as to threaten a total loſs of dominion to the Turks. During the laſt 50 years, the Porte having relaxed from its vigilance, ſuch a revolution has taken place, that the Turkiſh power is now almoſt reduced to nothing. But in order to underſtand this, we muſt conſider the way in which the race of Mamlouks is continued or multiplied in Egypt. This is not in the ordinary way, by marriage: on the contrary, M. Volney aſſures us, that "during 550 years in which there have been Mamlouks in Egypt, not one of them has left ſubſiſting iſſue; all their children periſh in the firſt or ſecond deſcent. Almoſt the ſame thing holds good with regard to the Turks; and it is obſerved, that they can only ſecure the continuance of their families by marrying women who are natives, which the Mamlouks have always diſdained. The means by which they are perpetuated and multiplied are the ſame by which they were firſt eſtabliſhed, *viz.* by ſlaves brought from their original country. From the time of the Moguls this commerce has been continued on the banks of the Cuban and Phaſis in the ſame manner as it is carried on in Africa, by the wars among the hoſtile tribes, and the miſery or avarice of the inhabitants, who ſell their children to ſtrangers. The ſlaves thus procured are firſt brought to Conſtantinople, and afterwards diſperſed through the empire, where they are purchaſed by the wealthy. When the Turks ſubdued Egypt (ſays M. Volney), they ſhould undoubtedly have prohibited this dangerous traffic; their omitting

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(A) Theſe ſangiacs are the governors of provinces.

(B) Each of theſe coins is in value about half a crown Engliſh; and the tribute ſince that time has been augmented to 800,000 aſlany, or about L. 100,000 Sterling.

(C) Each caſiz weighs 25 occa, and each occa is equal to two pounds ten ounces Engliſh avoirdupoiſe weight.

ting which ſeems about to diſpoſſeſs them of their conqueſt, and which ſeveral political errors have long been preparing.

"For a conſiderable time the Porte had neglected the affairs of this province; and in order to reſtrain the Pachas, had ſuffered the divan to extend its power till the chiefs of the janizaries and azabs were left without control. The ſoldiers themſelves, become citizens by the marriages they had contracted, were no longer the creatures of Conſtantinople; and a change introduced into their diſcipline ſtill more increaſed theſe diſorders. At firſt the ſeven military corps had one common treaſury; and though the ſociety was rich, individuals, not having any thing at their own diſpoſal, could effect nothing. The chiefs, finding their power diminiſhed by this regulation, had intereſt enough to get it aboliſhed, and obtained permiſſion to poſſeſs diſtinct property, lands, and villages. And as theſe lands and villages depended on the Mamlouk governors, it was neceſſary to conciliate them to prevent their oppreſſions. From that moment the beys acquired an aſcendancy over the ſoldiers, who till then had treated them with diſdain; and this could not but continually increaſe, ſince their governments procured them conſideable riches. Theſe they employed in creating themſelves friends and creatures. They multiplied their ſlaves; and after emancipating them, employed all their intereſt to promote them to various employments, and advance them in the army. Theſe upſtarts, retaining for their patrons the ſame ſuperſtitious veneration common in the Eaſt, formed factions implicitly devoted to their pleaſure."

107 Authority uſurped by Ibrahim Kiaya.

Thus, about the year 1746, Ibrahim, one of the kiayas (D) of the janizaries, rendered himſelf in reality maſter of Egypt; having managed matters ſo well, that of the 24 beys or ſangiacs eight were of his houſehold. His influence too was augmented by always leaving vacancies in order to enjoy the emoluments himſelf; while the officers and ſoldiers of his corps were attached to his intereſt; and his power was completed by gaining over Rodoan, the moſt powerful of all the colonels, to his intereſt. Thus the Pacha became altogether unable to oppoſe him, and the orders of the Sultan were leſs reſpected than thoſe of Ibrahim. On his death in 1757, his family, *i. e.* his enfranchiſed ſlaves, continued to rule in a deſpotic manner. Waging war, however, among each other, Rodoan and ſeveral other chiefs were killed; until, in 1766, Ali Bey, who had been a principal actor in the diſturbances, overcame his enemies, and for ſome time rendered himſelf abſolute maſter of Egypt.

108 Hiſtory of Ali Bey.

Of this man there are various accounts. The following is that given by M. Volney. He begins with obſerving, that the private hiſtory of the Mamlouks in general muſt be ſubject to great uncertainty, by reaſon of their being generally carried off from their parents at a time of life when they can remember but little or nothing of their parents; and he remarks, that they are likewiſe unwilling to communicate the little they may happen to remember. It is moſt commonly ſuppoſed, however, that Ali Bey was born among the Abazans, a people of Mount Caucaſus; from whom, next to the Circaſſians, the ſlaves moſt valued by the Turks, and other nations who deal in that commodity, are to be obtained. Having been brought to a public ſale at Cairo, Ali Bey was bought by two Jew brothers named Iſaac and Youſef, who made a preſent of him to Ibrahim Kiaya.

109 He is bought and educated by Ibrahim Kiaya.

At this time he is ſuppoſed to have been about 13 or 14 years old, and was employed by his patron in offices ſimilar to thoſe of the pages belonging to European princes. The uſual education was alſo given him; *viz.* that of learning to manage a horſe well; fire a carbine and piſtol; throw the djerid, a kind of dart uſed in the diverſions of that country, and which ſhall be afterwards deſcribed. He was alſo taught the exerciſe of the ſabre, and a little reading and writing. In all the feats of activity juſt mentioned, he diſcovered ſuch impetuoſity, that he obtained the ſurname of *Djendali*, or "madman;" and, as he grew up, diſcovered an ambition proportionable to the activity diſplayed in his youth. About the age of 18 or 20, his patron gave him his freedom; the badge of which among the Turks is the letting the beard grow, for among that people it is thought proper only for women and ſlaves to want a beard. By his kind patron alſo he was promoted to the rank of kachef or governor of a diſtrict, and at laſt elected one of the 24 beys. By the death of Ibrahim in 1757, he had an opportunity of ſatisfying his ambition; and now engaged in every ſcheme for the promotion or diſgrace of the chiefs, and had a principal ſhare in the ruin of Rodoan Kiaya above mentioned. Rodoan's place was quickly filled by another, who did not long enjoy it; and in 1762 Ali Bey, then ſtyled *Shaik-el-Beled*, having got Abdelrahman, the poſſeſſor at that time, exiled, procured himſelf to be elected in his room.

110 He is baniſhed, but returns, and throws off the Turkiſh yoke.

However, he ſoon ſhared the fate of the reſt, being condemned to retire to Gaza. This place, being under the dominion of a Turkiſh pacha, was by no means agreeable; for which reaſon Ali having turned off to another place, kept himſelf concealed for ſome time, until in 1766 his friends at Cairo procured his recal. On this he appeared ſuddenly in that city; and in one night killed four of the beys who were inimical to his deſigns, baniſhed the reſt, and aſſumed the whole power to himſelf. Still, however, his ambition was not ſatisfied; and he determined on nothing leſs than to throw off his dependence on the Porte altogether, and become ſultan of Egypt. With this view he expelled the pacha, refuſed to pay the accuſtomed tribute, and in the year 1768 proceeded to coin money in his own name. The Porte being at that time on the eve of a dangerous war with Ruſſia, had not leiſure to attend to the proceedings of Ali Bey; ſo that the latter had an opportunity of going forward with his enterprizes very vigorouſly.

111 Overcomes an Arabian prince.

His firſt expedition was againſt an Arabian prince named *Hammam*; againſt whom he ſent his favourite Mohammed Bey, under pretence that the former had concealed a treaſure entruſted with him by Ibrahim Kiaya, and that he afforded protection to rebels. Having deſtroyed this unfortunate prince, he next began to put in execution a plan propoſed to him by

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(D) Theſe were the commanding officers of the janizaries, azabs, &c. who after the firſt year laid down their employments, and became veterans, with a voice in the divan.

112 Propoſes to make Mecca the emporium of Eaſt Indian commerce.

by a young Venetian merchant, of rendering Gedda, the port of Mecca, an emporium for all the commerce of India; and even imagined he ſhould be able to make the Europeans abandon the paſſage to the Indies by the Cape of Good Hope. With this view, he fitted out ſome veſſels at Suez; and manning them with Mamlouks, commanded the bey Haſſan to ſail with them to Gedda, and ſeize upon it, while a body of cavalry under Mohammed Bey advanced againſt the town. Both theſe commiſſions were executed according to his wiſh, and Ali became quite intoxicated with his ſucceſs. Nothing but ideas of conqueſt now occupied his mind, without conſidering the immenſe diſproportion between his own force and that of the Grand Signior. Circumſtances, it muſt be owned, were at that time very favourable to his ſchemes. The Sheik Daher was in rebellion againſt the Porte in Syria; and the pacha of Damaſcus had ſo exaſperated the people by his extortions, that they were ready for a revolt.

113 His expedition into Syria.

Having therefore made the neceſſary preparations, Ali Bey diſpatched in 1770 about 500 Mamlouks to take poſſeſſion of Gaza, and thus ſecure an entrance into Paleſtine. Oſman the pacha of Damaſcus, however, no ſooner heard of the invaſion than he prepared for war with the utmoſt diligence, while the troops of Ali Bey held themſelves in readineſs to fly on the firſt attack. They were relieved from their embarraſſment by Sheik Daher, who haſtened to their aſſiſtance, while Oſman fled without even offering to make the leaſt reſiſtance; thus leaving the enemy maſters of all Paleſtine without ſtriking a ſtroke. About the end of February 1771, the grand army of Ali Bey arrived; which, by the repreſentations made of it in Europe, was ſuppoſed to conſiſt of 60,000 men.

114 Volney's account of this army.

M. Volney, however, informs us, that this army was far from containing 60,000 ſoldiers; though he allows that there might be two-thirds of that number, who were claſſed as follows: 1. Five thouſand Mamlouks, conſtituting the whole effective part of the army. 2. Fifteen hundred Arabs from Barbary on foot, conſtituting the whole infantry of the army. Beſides theſe, the ſervants of the Mamlouks, each of whom had two, would conſtitute a body of 10,000 men. A number of other ſervants would conſtitute a body of about 2000; and the reſt of the number would be made up by ſutlers and other uſual attendants on armies. It was commanded by Mohammed Bey the friend of Ali. "But (ſays our author) as to order and diſcipline, theſe muſt not be mentioned. The armies of the Turks and Mamlouks are nothing but a confuſed multitude of horſemen, without uniforms, on horſes of all colours and ſizes, without either keeping their ranks or obſerving any regular order." This rabble took the road to Acre, leaving wherever they paſſed ſufficient marks of their rapacity and want of diſcipline. At Acre a junction was formed with the troops of Sheik Daher, conſiſting of 1500 Safadians (the name of Shaik Daher's ſubjects, from *Safad*, a village of Galilee, originally under his juriſdiction). Theſe were on horſeback, and accompanied by 1200 Motualis cavalry under the command of Sheik Naſif, and about 1000 Mogrebian infantry. Thus they proceeded towards Damaſcus, while Oſman prepared to oppoſe them by another army equally numerous and ill regulated: and M. Volney gives the following deſcription of their operations.

115 Their abſurd method of carrying on war.

"The reader muſt not here figure to himſelf a number of complicated and artificial movements; ſuch as thoſe which, within the laſt century, have reduced war with us to a ſcience of ſyſtem and calculation. The Aſiatics are unacquainted with the firſt elements of this conduct. Their armies are mere mobs, their marches ravages, their campaigns inroads, and their battles bloody frays. The ſtrongeſt or the moſt adventurous party goes in queſt of the other, which frequently flies without making any reſiſtance. If they ſtand their ground, they engage pell-mell, diſcharge their carbines, break their ſpears, and hack each other with their ſabres; for they have ſeldom any cannon, and when they have, they are but of little ſervice. A panic frequently diffuſes itſelf without cauſe; one party flies, the other ſhouts victory; the vanquiſhed ſubmit to the will of the conqueror, and the campaign often terminates without a battle.

"Such, in a great meaſure, were the military operations in Syria in the year 1771. The combined army of Ali Bey and Sheik Daher marched to Damaſcus. The Pachas waited for them; they approached, and, on the 6th of June, a deciſive action took place: the Mamlouks and Safadians ruſhed on the Turks with ſuch fury, that, terrified at their courage, they immediately took to flight, and the Pachas were not the laſt in endeavouring to make their eſcape. The allies became maſters of the country, and took poſſeſſion of the city without oppoſition, there being neither walls nor ſoldiers to defend it. The caſtle alone reſiſted. Its ruined fortifications had not a ſingle cannon, much leſs gunners; but it was ſurrounded by a muddy ditch, and behind the ruins were poſted a few muſketeers; and theſe alone were ſufficient to check this army of cavalry. As the beſieged, however, were already conquered by their fears, they capitulated the third day, and the place was to be ſurrendred next morning, when, at day-break, a moſt extraordinary revolution took place."

116 Defection of Ali Bey's general.

This was no leſs than the defection of Mohammed Bey himſelf, whom Oſman had gained over in a conference during the night. At the moment, therefore, that the ſignal of ſurrender was expected, this treacherous general ſounded a retreat, and turned towards Egypt with all his cavalry, flying with as great precipitation as if he had been purſued by a ſuperior army. Mohammed continued his march with ſuch celerity, that the report of his arrival in Egypt reached Cairo only ſix hours before him. Thus Ali Bey found himſelf at once deprived of all his expectations of conqueſt; and what was worſe, found a traitor whom he durſt not puniſh at the head of his forces. A ſudden reverſe of fortune now took place. Several veſſels laden with corn for Sheik Daher were taken by a Ruſſian privateer; and Mohammed Bey, whom he deſigned to have put to death, not only made his eſcape, but was ſo well attended, that he could not be attacked.

117 He is driven out of Cairo, and with difficulty gets into Syria.

His followers continuing daily to increaſe in number, Mohammed ſoon became ſufficiently ſtrong to march towards Cairo; and, in the month of April 1772, having defeated the troops of Ali in a rencounter, entered the city ſword in hand, while the latter had ſcarce time to make his eſcape with 800 Mamlouks. With difficulty he was enabled to get to Syria by the aſſiſtance of Sheik Daher, whom he immediately joined with the

troops

118
Defeats the Turks, and retrieves his affairs.

119
He is ruined by his own impatience.

troops he had with him. The Turks under Oſman were at that time beſieging Sidon, but raiſed the ſiege on the approach of the allied army, conſiſting of about 7000 cavalry. Though the Turkiſh army was at leaſt three times their number, the allies did not heſitate to attack them, and gained a complete victory. Their affairs now began to wear a more favourable aſpect; but the military operations were retarded by the ſiege of Yafa, a place which had revolted; and which, though defended only by a garden wall, without any ditch, held out for eight months. In the beginning of 1773 it capitulated, and Ali Bey began to think of returning to Cairo. For this purpoſe Sheik Daher had promiſed to furniſh him with ſuccours; and the Ruſſians, with whom he had now contracted an alliance, made him a promiſe of the like kind. Ali, however, ruined every thing by his own impatience. Deceived by an aſtrologer, who pretended that the auſpicious moment when he was highly favoured by the ſtars was juſt arrived, he would needs ſet out without waiting for the arrival of his allies. He was alſo farther deceived by a ſtratagem of Mohammed, who had by force extorted from the friends of Ali Bey letters preſſing his return to Cairo, where the people were weary of his ungrateful ſlave, and wanted only his preſence in order to expel him. Confiding in theſe promiſes, Ali Bey imprudently ſet out with his Mamlouks and 1500 Safadians given him by Daher; but had no ſooner entered the deſert which ſeparates Gaza from Egypt, than he was attacked by a body of 1000 choſen Mamlouks who were lying in wait for his arrival. They were commanded by a young Bey, named *Mourad;* who, being enamoured of the wife of Ali Bey, had obtained a promiſe of her from Mohammed, in caſe he could bring him her huſband's head. As ſoon as Mourad perceived the duſt by which the approach of Ali Bey's army was announced, he ruſhed upon him, attacked and took priſoner Ali Bey himſelf, after wounding him in the forehead with a ſabre. Being conducted to Mohammed Bey, the latter pretended to treat him with extraordinary reſpect, and ordered a magnificent tent to be erected for him; but in three days he was found dead of his wounds, as was given out; though ſome affirm, perhaps with equal reaſon, that he was poiſoned.

120
Is ſucceeded by Mohammed Bey

121
His expedition againſt Sheik Daher.

122
Account of the ſiege of Yafa: a ſpecimen of the Aſiatic method of beſieging towns.

After the death of Ali Bey, Mohammed Bey took upon him the ſupreme dignity; but this change of maſters proved of very little ſervice to the Egyptians. At firſt he pretended to be only the defender of the rights of the Sultan, remitted the uſual tribute to Conſtantinople, and took the cuſtomary oath of unlimited obedience; after which he ſolicited permiſſion to make war upon Sheik Daher, the ally of Ali Bey. The reaſon of this requeſt was a mere perſonal pique; and as ſoon as it was granted, he made the moſt diligent preparations for war. Having procured an extraordinary train of artillery, he provided foreign gunners, and gave the command of them to an Engliſhman named Robinſon. He brought from Suez a cannon 16 feet long, which had for a conſiderable time remained uſeleſs; and at length, in the month of February 1776, he appeared in Syria with an army equal in number to that which he had formerly commanded when in the ſervice of Ali Bey. Daher's forces, deſpairing of being able to cope with ſuch a formidable armament, abandoned Gaza, which Mohammed immediately took poſſeſſion of, and then marched towards a fortified town named Yafa. The hiſtory of this ſiege M. Volney gives as a ſpecimen of the Aſiatic manner of conducting operations of that kind. "Yafa (ſays he), the ancient Joppa, is ſituated on a part of the coaſt, the general level of which is very little above the ſea. The city is built on an eminence, in the form of a ſugar loaf, in height about 130 feet perpendicular. The houſes, diſtributed on the declivity, appear riſing above each other, like the ſteps of an amphitheatre. On the ſummit is a ſmall citadel, which commands the town; the bottom of the hill is ſurrounded by a wall without a rampart, of 12 or 14 feet high, and two or three in thickneſs. The battlements on the top are the only tokens by which it is diſtinguiſhed from a common garden wall. This wall, which has no ditch, is environed by gardens, where lemons, oranges, and citrons grow in this light ſoil to a moſt prodigious ſize. The city was defended by five or ſix hundred Safadians and as many inhabitants, who, at the ſight of the enemy, armed themſelves with their ſabres and muſkets; they had likewiſe a few braſs cannon, 24 pounders, without carriages; theſe they mounted as well as they could, on timbers prepared in a hurry; and ſupplying the place of experience by hatred and courage, they replied to the ſummons of the enemy with menaces and cannon-ſhot.

"Mohammed, finding he muſt have recourſe to force, formed his camp before the town; but was ſo little acquainted with the buſineſs in which he was engaged, that he advanced within half cannon-ſhot. The bullets, which ſhowered upon the tents, apprizing him of his error, he retreated; and, by making a freſh experiment, was convinced he was ſtill too near. At length he diſcovered the proper diſtance, and ſet up his tent, in which the moſt extravagant luxury was diſplayed: around it, without any order, were pitched thoſe of the Mamlouks, while the Barbary Arabs formed huts with the trunks and branches of the orange and lemon-trees, and the followers of the army arranged themſelves as they could: a few guards were diſtributed here and there; and, without making a ſingle entrenchment, they called themſelves encamped.

"Batteries were now to be erected; and a ſpot of riſing ground was made choice of to the ſouth-eaſtward of the town, where, behind ſome garden walls, eight pieces of cannon were pointed, at 200 paces from the town; and the firing began, notwithſtanding the muſketry of the enemy, who, from the tops of the terraces, killed ſeveral of the gunners.

"It is evident that a wall only three feet thick, and without a rampart, muſt ſoon have a large breach in it; and the queſtion was not how to mount, but how to get through it. The Mamlouks were for doing it on horſeback; but they were made to comprehend that this was impoſſible; and they conſented, for the firſt time, to march on foot. It muſt have been a curious ſight to ſee them, with their huge breeches of thick Venetian cloth, embarraſſed with their tucked up *beniches*, their crooked ſabres in hand, and piſtols hanging to their ſides, advancing and tumbling among the ruins of the wall. They imagined that they had conquered every difficulty when this obſtacle was ſurmounted; but the beſieged, who formed a better judgment, waited till they arrived at the empty ſpace between the city and wall; where they aſſailed them from the terraces and windows of the houſes with ſuch a ſhower of bullets, that the Mamlouks did not ſo much as think of ſetting them on fire, but retired under a perſuaſion that the breach was utterly impracticable, ſince it was impoſſible to enter it on horſeback. Morad Bey brought them ſeveral times back to the charge, but in vain.

123 The town taken and the inhabitants maſſacred.

“ Six weeks paſſed in this manner; and Mohammed was diſtracted with rage, anxiety, and deſpair. The beſieged however, whoſe numbers were diminiſhed by the repeated attacks, became weary of defending alone the cauſe of Daher. Some perſons began to treat with the enemy; and it was propoſed to abandon the place, on the Egyptians giving hoſtages. Conditions were agreed upon, and the treaty might be conſidered as concluded, when, in the midſt of the ſecurity occaſioned by this belief, ſome Mamlouks entered the town; numbers of others followed their example, and attempted to plunder. The inhabitants defended themſelves, and the attack recommenced: the whole army then ruſhed into the town, which ſuffered all the horrors of war; women and children, young and old men, were all cut to pieces, and Mohammed, equally mean and barbarous, cauſed a pyramid formed of the heads of theſe unfortunate ſufferers to be raiſed as a monument of his victory.”

124 Death of Mohammed Bey.

By this diſaſter the greateſt terror and conſternation were every where diffuſed. Sheik Daher himſelf fled, and Mohammed ſoon became maſter of Acre alſo. Here he behaved with his uſual cruelty, and abandoned the city to be plundered by his ſoldiers. The French merchants claimed an exemption, and it was procured with the utmoſt difficulty: nor was even this likely to be of any conſequence; for Mohammed, informed that the treaſures of Ibrahim Kiaya of Daher had been depoſited in that place, made an immediate demand of them, threatening every one of the merchants with death if the treaſures were not inſtantly produced. A day was appointed for making the reſearch; but before this came, the tyrant himſelf died of a malignant fever after two days illneſs. His death was no ſooner known than the army made a precipitate retreat, ſuch as has been already mentioned from Damaſcus. Sheik Daher continued his rebellion for ſome time, but was at laſt entirely defeated, and his head ſent to Conſtantinople by Haſſan Pacha the Turkiſh high-admiral.

125 Hiſtory of Egypt from that time to the year 1786.

The death of Mohammed was no ſooner known in Egypt, than Morad Bey haſtened to Cairo in order to diſpute the ſovereignty with Ibrahim Bey, who had been entruſted with the government on his departure from that place for Syria. Preparations for war were made on both ſides; but at laſt, both parties finding that the conteſt muſt be attended with great difficulty, as well as very uncertain in the event, thought proper to come to an accommodation, by which it was agreed that Ibrahim ſhould retain the title of Shaik El Beled, and the power was to be divided between them. But now the beys and others who had been promoted by Ali Bey, perceiving their own importance totally annihilated by this new faction, reſolved to ſhake off the yoke, and therefore united in a league under the title *of the Houſe of Ali Bey*. They conducted their matters with ſo much ſilence and dexterity, that both Morad and Ibrahim were obliged to abandon Cairo. In a ſhort time, however, they returned and defeated their enemies though three times their number; but notwithſtanding this ſucceſs, it was not in their power totally to ſuppreſs the party. This indeed was owing entirely to their unſkilfulneſs in the art of war, and their operations for ſome time were very trifling. At laſt, a new combination having been formed among the beys, five of them were ſentenced to baniſhment in the Delta. They pretended to comply with this order, but took the road of the deſert of the Pyramids, through which they were purſued for three days to no purpoſe. At laſt they arrived ſafe at *Miniah*, a village ſituated on the Nile, 40 leagues above Cairo. Here they took up their reſidence, and being maſters of the river, ſoon reduced Cairo to diſtreſs by intercepting its proviſions. Thus a new expedition became neceſſary, and Ibrahim took the command of it upon himſelf. In the month of October 1783, he ſet out with an army of 3000 cavalry; the two armies ſoon came in ſight of each other, but Ibrahim thought proper to terminate the affair by negociation. This gave ſuch offence to Morad, who ſuſpected ſome plot againſt himſelf, that he left Cairo. A war betwixt the two rivals was now daily expected, and the armies continued for 25 days in ſight of each other, only ſeparated by the river. Negociations took place; and the five exiled beys, finding themſelves abandoned by Morad, took to flight, but were purſued and brought back to Cairo. Peace ſeemed now to be re-eſtabliſhed; but the jealouſy of the two rivals producing new intrigues, Morad was once more obliged to quit Cairo in 1784. Forming his camp, however, directly at the gates of the city, he appeared ſo terrible to Ibrahim, that the latter thought proper in his turn to retire to the deſert, where he remained till March 1785. A new treaty then took place; by which the rivals agreed to ſhare the power between them, though there was certainly very little probability that ſuch a treaty would be long obſerved. Since that time we have no accounts of any remarkable tranſaction in Egypt; nor indeed can we reaſonably expect any thing of conſequence in a country where matters are managed, as M. Volney expreſſes himſelf, by a ſeries of “ cabals, intrigues, treachery, and murders.”

Of late Egypt has been viſited by ſeveral travellers, all of whom have publiſhed deſcriptions of the country, its productions, inhabitants, &c. The lateſt are M. Savary, M. Volney, the baron de Tott, and Mr Bruce; and from the accounts publiſhed by thoſe gentlemen the following geographical deſcription is principally compiled.

126 Account of the country.

This country is ſtill divided into two principal parts, called the *Upper* and *Lower Egypt*. According to M. Savary, the former is only a long narrow valley beginning at Sienna and terminating at Cairo. It is bounded by two chains of mountains running from north to ſouth, and taking their riſe from the laſt cataract of the Nile. On reaching the latitude of Cairo they ſeparate to the right and left; the one taking the direction of mount Colzoum, the other terminating in ſome ſand-banks near Alexandria; the former being compoſed of high and ſteep rocks, the latter of ſandy hillocks over a bed of calcareous ſtone. Beyond theſe mountains are deſerts bounded by the Red Sea on the eaſt, and on the weſt by other parts of Africa; having in the middle that long plain which, even where wideſt, is not more than nine leagues over. Here the Nile is confined in its courſe betwixt theſe inſuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr Bruce obſerves that there is a gradual ſlope from the bed of the river to thoſe mountains on both ſides. The baron de Tott ſays, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks about 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the courſe of the river, at a greater or leſſer diſtance, and ſeems as if only intended to ſerve as a bank to the general inundation."

Lower Egypt, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the Iſthmus of Suez, and Libya. "This immenſe plain (ſays he) preſents on the borders of its parching ſands a ſtripe of lands cultivated along the canals of the river, and in the middle a triangular iſland to which the Greeks gave the name of *Delta*;" at the top of the angle of which the Baron de Tott informs us the rocks of Libya and the coaſts of Arabia open and recede from each other towards the eaſt and weſt, parallel to the Mediterranean. This great extent of country, from the kingdom of Barca to Gaza, is either overflowed by the river, or capable of being ſo; which thus fertilizes in a high degree a tract of country ſeemingly devoted to perpetual barrenneſs on account of the want of rain and the heat of the climate.

127 Coaſt of Egypt extremely low.

According to the teſtimonies of both Mr Bruce and M. Volney, the coaſt of Egypt is ſo extremely low, that it cannot be diſcovered at ſea till the mariners come within a few leagues of it. In ancient times the ſailors pretended to know when they approached this country by a kind of black mud brought up by their ſounding-line from the bottom of the ſea: but this notion, though as old as the days of Herodotus, has been diſcovered to be a miſtake by Mr Bruce; who found the mud in queſtion to ariſe while the veſſel was oppoſite to the deſerts of Barca. All along the coaſt of Egypt a ſtrong current ſets to the eaſtward.

128 Of the fertility of ancient and modern Egypt.

In former times Egypt was much celebrated for its fertility; and there is great reaſon to believe, that were the ſame pains beſtowed upon the cultivation of the ground, and the diſtribution of the waters of the Nile in a proper manner, the ſame fertility would ſtill be found to remain. The cauſe of decreaſe in the produce of Egypt we ſhall deſcribe in the words of M. Savary. "The canals," ſays he, ſpeaking of the Delta, "which uſed to convey fertility with their waters, are now filled. The earth no longer watered, and continually expoſed to the burning ardour of the ſun, is converted into a barren ſand. In thoſe places where formerly were ſeen rich fields and flouriſhing towns, on the Peluſiac, the Tarictic, and the Mendeſian branches, which all ſtrike out from the canal of Damietta, nothing is to be found at this day but a few miſerable hamlets, ſurrounded by date-trees and by deſerts. Theſe once navigable canals are now no more than a vain reſemblance of what they were: they have no communication with the lake Menzall, but what is merely temporary, on the ſwelling of the Nile; they are dry the remainder of the year. By deepening them by removing the mud depoſited by the river ſince the Turks have made themſelves maſters of Egypt, the country they paſs through would be again fertilized, and the Delta recover a third of its greatneſs."

129 Savary's account of the formation of the Delta.

Concerning this iſland, it has been the opinion of a great many, even from very ancient times, that it was produced by the mud brought down by the inundations of the Nile; and this opinion we find adopted in the ſtrongeſt manner by M. Savary. His account of the ſuppoſed riſe of the Delta, and indeed of the greateſt part of Egypt, is to the following purpoſe. In thoſe early ages where hiſtory has not fixed any epoch, a certain people deſcended from the mountains near the cataracts, into the valley overflowed by the Nile, and which was then an uninhabitable moraſs overgrown with reeds and canes. In what manner, or from what motive, theſe people were induced to deſcend from their ancient habitations to ſuch a place, or how they found means to penetrate into a moraſs which he expreſsly tells us was *impenetrable*, we are not informed, neither is it to our preſent purpoſe to inquire. At that time, however, the ſea bathed the feet of thoſe mountains where the pyramids are built, and advanced far into Libya. It covered alſo part of the Iſthmus of Suez, and every part of what we now call the Delta formed a great gulph. After many ages the Egyptians, by what means is unknown, at leaſt not ſpecified by our author (though they ought to have been ſo, as the country it ſeems was then overflowed not only by the river but by the ocean), formed canals to carry off the ſtagnant waters of the Nile; oppoſed ſtrong dykes to its ravages; and, tired of dwelling in the caverns of rocks, built towns and cities upon ſpots elevated either by nature or art. Already the river was kept within its bounds, the habitations of men were out of the reach of its inundations, and experience had taught the people to foreſee and announce them. One of the kings of Egypt undertook to change the courſe of the river. After running 150 leagues between the barriers already mentioned, meeting with an unſurmountable obſtacle to the right, it turned ſuddenly to the left; and taking its courſe to the ſouthward of Memphis, it ſpread its waters thro' the ſands of Libya. The prince we ſpeak of cauſed a new bed to be dug for it to the eaſt of Memphis; and by means of a large dyke obliged it to return between the mountains, and diſcharge itſelf into the gulph that bathes the rock on which the caſtle of Cairo is built. The ancient bed of the river was ſtill to be ſeen in the time of Herodotus, and may even be traced at this day acroſs the deſerts, paſſing to the weſtward of the lakes of Natrum. The Arabs ſtill beſtow upon it the name of *Bahr Bela ma*, "or ſea without water," and it is now almoſt choaked up. To the labours of this monarch Egypt is indebted for the Delta. A reflux of the ſea was occaſioned by the enormous weight of the waters of the Nile, which precipitated themſelves into the bottom of the gulph. Thus the ſands and mud carried along with them were collected into heaps; and thus the Delta, at firſt very inconſiderable, roſe out of the ſea of which it repelled the limits. It was a gift of the river, and it has ſince been defended from the attacks of the ocean by raiſing dykes around it. Five hundred years before the Trojan war, according to Herodotus, the Delta was in its infancy; eight cubits of water being then ſufficient to overflow it. Strabo tells us, that boats paſſed over it from one extremity to the other; and that its towns, built upon artificial eminences, reſembled the iſlands of the Egean Sea. At the time that Herodotus viſited this country, 15 cubits were neceſſary to cover all the Lower Egypt; but the Nile then overflowed the country for the ſpace of two days journey to the right and left of the iſland. Under the Roman empire, 16 cubits performed the ſame effect. When the Arabs came to have the dominion, 17 cubits were requiſite; and at this day 18 are neceſſary to produce a plentiful crop; but the inundation ſtops at Cairo and the neighbouring country, without being extended over the Lower Egypt. Sometimes, however, the Nile riſes to 22 cubits; and the cauſe of this phenomenon is the mud for ſo many years accumulated no the iſland. Here, in the ſpace of 3284 years, we ſee the Delta elevated 14 cubits. Our author wrote in 1777, and informs us that he twice made the tour of the iſland during the time of the inundation. "The river (ſays he) flowed in full ſtreams in the great branches of Roſetta and Damietta, as well as in thoſe which paſs through the interior part of the country; but it did not overflow the lands, except in the lower parts, where the dykes were pierced for the purpoſe of watering the plantations of rice. We muſt not, however, imagine, as ſeveral travellers pretend, that this iſland will continue to riſe, and that it will become unfruitful. As it owes its increaſe to the annual ſettling of the mud conveyed thither by the Nile, when it ceaſes to be overflowed it will no longer increaſe in height, for it is demonſtrated that culture is not ſufficient to raiſe land.

"It is natural to imagine that the Delta has increaſed in length as well as in height; and of this we may look upon the following fact to be a remarkable proof. Under the reign of Pſammiticus, the Mileſians, with 30 veſſels, landed at the mouth of the Bolbitine branch of the Nile, now called that of *Roſetta*, where they fortified themſelves. There they built a town called *Metelis*, the ſame as *Faoüe*, which, in the Coptic vocabularies, has preſerved the name of *Meſſil*. This town, formerly a ſea-port, is now nine leagues diſtant from the ſea; all which ſpace the Delta has increaſed in length from the time of Pſammiticus to the preſent. Homer, in his Odyſſey, puts the following words in the mouth of Menelaus. 'In the ſtormy ſea which waſhes Egypt, there is an iſland called *Pharos*. Its diſtance from the ſhore is ſuch, that a veſſel with a fair wind may make the paſſage in a day.' From the way in which he ſpeaks of this iſland in other places, alſo, we may ſuppoſe that the iſland of Pharos, in his time, was not leſs than 20 leagues diſtant from the Egyptian coaſt, though now it forms the port of Alexandria; and this ſentiment is confirmed by the moſt ancient writers.

"What prodigious changes great rivers occaſion on the ſurface of the globe! How they elevate, at their mouths, iſlands which become at length large portions of the continent! It is thus that the Nile has formed almoſt all the Lower Egypt, and created out of the waters the Delta, which is 90 leagues in circumference. It is thus that the Meander, conſtantly repelling the waves of the Mediterranean, and gradually filling up the gulph into which it falls, has placed in the middle of the land the town of Miletis, formerly a celebrated harbour. It is thus that the Tigris and the Euphrates, let looſe from the Armenian hills, and ſweeping with them in their courſe the ſands of Meſopotamia, are imperceptibly filling up the Perſian gulph."

130
Mr Bruce's reaſons for the contrary opinion.

Theſe are the reaſons aſſigned by M. Savary for thinking that the Delta, as well as the greateſt part of the Lower Egypt, have been produced by the Nile; but this opinion is violently conteſted by other late travellers, particularly Mr Bruce, who has given a pretty long diſſertation upon it, as well as many occaſional remarks through the courſe of his work. He begins with obſerving, 1. That the country of Egypt is entirely a valley bounded by rugged mountains; whence it might ſeem natural to imagine that the Nile, overflowing a country of this kind, would be more ready to waſh away the ſoil than to add to it. 2. It is obſerved by Dr Shaw, and the ſame is confirmed by our author, that there is a gentle ſlope from the middle of the valley to the foot of the mountains on each ſide; ſo that the middle, in which is the channel of the Nile, is really higher than any other part of the valley. Large trenches are cut acroſs the country from the channel of the river, and at right angles with it, to the foot of the mountains. 3. As the river ſwells, the canals become filled with water, which naturally deſcending to the foot of the mountains, runs out at the farther end, and overflows the adjacent level country. 4. When the water, having attained the loweſt ground, begins to ſtagnate, it does not acquire any motion by reaſon of the canal's being at right angles with the channel of the Nile, unleſs in the caſe of exceſſive rains in Ethiopia, when the water by its regurgitation again joins the ſtream. In this caſe, the motion of the current is communicated to the whole maſs of waters, and every thing is ſwept away by them into the ſea. 5. It has been the opinion of ſeveral authors, that there was a neceſſity for meaſuring the height of the inundation on account of the quantity of mud brought down annually by the waters, by which the land-marks were ſo covered, that the proprietors could not know their own grounds after the river ſubſided. But whatever might be the reaſon of this covering of the land-marks in ancient times, it is certain that the mud left by the Nile could not be ſo in the time of Herodotus, or during any period of time aſſigned by that hiſtorian; for he aſſigns only one foot of increaſe of ſoil throughout Egypt in an hundred years from the mud left by the river: the increaſe during one year, therefore, being only the hundredth part of a foot, could not cover any land-mark whatever. Beſides, the Egyptian lands are at this day parted by huge blocks of granite, which frequently have gigantic heads at the ends of them; and theſe could not, at the rate mentioned by Herodotus, be covered in ſeveral thouſand years. 6. The Nile does not now bring down any great quantity of mud; and it is abſurd to ſuppoſe that it can at preſent bring down as much as it did ſoon after the creation, or the ages immediately ſucceeding the deluge. Throughout Abyſſinia, according to the teſtimony of our author, the channel of every torrent is now worn to the bare rock, and almoſt every rivulet runs in a hard ſtony bed, all the looſe earth being long ago waſhed away; ſo that an annual and equable increaſe of the earth from the ſediment of the waters is impoſſible. 7. Our author made a great number of trials of the water of the Nile during the time of its inundation in different places. At Baſboch, when juſt coming down from the cultivated parts of Abyſſinia, and before it enters Sennaar, the ſediment is compoſed of fat earth and ſand, and its quantity is exceedingly ſmall. At the junction of the Nile and Aſtaboras the quantity of ſediment is very little augmented; conſiſting ſtill of the ſame materials, but now moſtly ſand. At Syene the quantity of ſediment was almoſt nine times greater than before; but was now compoſed almoſt entirely of ſand, with a very ſmall quantity of black earth. The concluſion of our author's experiments, however, is different from what we ſhould have been led to expect from theſe juſt mentioned. "The experiment at Roſetta (ſays he) was not ſo often repeated as the others: but the reſult was, that in the ſtrength of the inundation the ſediment conſiſted moſtly of ſand; and, towards the end, was much the greater part earth. I think theſe experiments concluſive, as neither the Nile coming freſh from Abyſſinia, nor the Atbara, though joined by the Mareb, likewiſe from the ſame country, brought any great quantity of ſoil from thence."

8. Our author goes on to obſerve, that had the Nile brought down the quantities of mud which it has been ſaid to do, it ought to have been moſt charged with it at Syene; as there it contained the whole that was to be conveyed by it into Egypt. Inſtead of this, however, the principal part of the ſediment at this place was ſand; and this is very naturally accounted for from the vaſt quantities of ſand taken up by the winds in the deſerts between Gooz and Syene. Here our traveller frequently ſaw vaſt pillars of this kind of ſand, which is ſo fine and light as to form an impalpable powder, traverſing the deſert in various directions. Many of theſe were driven upon the river; and when it became calm in the evening, fell down into it entirely; thus affording materials for the many ſandy iſlands to be met with in the Nile.

9. Mr Bruce adopts the opinion of thoſe who ſuppoſe that there has been a continual decreaſe of water ſince the creation of the world. In this caſe, therefore, if the land of Egypt had been continually increaſing in height while the water that was to cover it decreaſed; there muſt have been frequent famines on account of the want of a ſufficient inundation. But ſo far is this from being the caſe, that, according to the teſtimony of ſeveral Arabian MSS. there had not, when Mr Bruce was in Egypt, been one ſcarce ſeaſon from the lowneſs of the inundation for 34 years; tho' during the ſame ſpace they had three times experienced a famine by too great an abundance of water, which carried away the millet.

10. If there had been ſuch an increaſe of land as Herodotus and others ſuppoſe, it muſt now have been very perceptible in ſome of the moſt ancient public monuments. This, however, is by no means the caſe. The baſe of every obeliſk in Upper Egypt is to this day quite bare and viſible. Near Thebes there are ſtill extant two Coloſſal ſtatues, plainly deſigned for nilometers, and which ought by this time to have been almoſt covered with earth; but notwithſtanding the length of time theſe have remained there, they are ſtill bare to the very baſe.

131
Opinions of various authors concerning the riſe of the Nile in ancient times.

The ſtrongeſt argument which the advocates for the increaſe of land of Egypt can make uſe of is, that the meaſures by which the quantity of inundation is determined are ſmaller now than in former times; and theſe ſmall meaſures are ſaid to have been introduced by the Saracens. On this Mr Bruce very juſtly obſerves, that ſuch an expedient could not have anſwered any good purpoſe; as no decreaſe of the meaſure could have augmented the quantity of corn produced by the ground. M. Savary obſerves, that, to render his calculation concerning the growth of land in Egypt abſolutely exact, it would be neceſſary to determine the preciſe length of the Greek, Roman, and Arabian cubit; and even to know the different alterations which that meaſure had undergone among theſe people: But this nicety he thinks needleſs; looking upon the general fact to be fully eſtabliſhed by what he had ſaid before. Mr Bruce, however, has treated the ſubject with much greater accuracy. He obſerves, that from the ſituation of Canopus, the diſtance betwixt Egypt and Cyprus, and the extenſion of the land to the northward, it appears that no addition of any conſequence has been made to it for 3000 years paſt. The only argument left for the increaſe of land therefore muſt be taken from the nilometer. The uſe of this inſtrument was to determine the quantity of inundation, that ſo it might be known whether the crop would be ſufficient to enable the people to pay the taxes exacted of them by the ſovereign or not. The firſt ſtep was to know what ſpace of ground was overflowed in a given number of years; and this being determined by menſuration, the next thing was to aſcertain the produce of the ground upon an average. Thus becoming acquainted with the greateſt and leaſt crops produced, together with the exact extent of ground overflowed, they were furniſhed with all the neceſſary principles for conſtructing a nilometer; and nothing now remained but to erect a pillar in a proper place, and divide it exactly into cubits. This was accordingly done; the pillar was firſt divided into cubits and theſe again were ſubdivided into digits. The firſt diviſion of this kind was undoubtedly that mentioned in ſcripture, and called the *cubit of a man;* being the length of the arm from the middle of the round bone in the elbow to the point of the middle finger; a meaſure ſtill in uſe among all rude nations. As no ſtandard could be found by which this meaſure might be exactly determined, authors have differed very much concerning the true length of the cubit when reduced to our feet and inches. Dr Arbuthnot reckons two cubits mentioned in ſcripture; one of them containing one foot nine inches and $\frac{888}{1000}$ of an inch; the other one foot and $\frac{824}{1000}$ of a foot; but Mr Bruce is of opinion that both of theſe are too large. He found, by menſuration, the Egyptian cubit to be exactly one foot five inches and three-fifths of an inch; and Herodotus mentions, that in his time the cubit uſed for determining the increaſe of the Nile was the Samian cubit, about 18 of our inches. The latter alſo informs us, that in the time of Moeris, the minimum of increaſe was 8 cubits, at which time all Egypt below the city of Memphis was overflowed; but that in his time 16 or at leaſt 15 cubits were neceſſary to produce the ſame effect. But to this account Mr Bruce objects, that Herodotus could have no certain information concerning the nilometer, becauſe he himſelf ſays that the prieſts, who alone had acceſs to it, would tell him nothing of the matter. Herodotus alſo informs us, that in the time of Moeris, great lakes were dug to carry off the waters of the inundation; and this ſuperfluous quantity Mr Bruce ſuppoſes to have been conveyed into the deſert for the uſe of the Arabs, and that by ſuch a vaſt drain the riſe of the water on the nilometer would undoubtedly be diminiſhed. But even granting that there was ſuch a difference between the riſe of the water in the time of Moeris and in that of Herodotus, it does not appear that any thing like it has appeared ever ſince. Strabo, who travelled into Egypt 400 years after the time of Herodotus, found that eight cubits were then the minimum, as well as in the time of Moeris. From ſome paſſages in Strabo, however, it appears that it required a particular exertion of induſtry to cauſe this quantity of water produce a plentiful crop; but there is not the leaſt reaſon to ſuppoſe, that the very ſame induſtry was not neceſſary in the time of Moeris; ſo that ſtill there is not any increaſe of land indicated by the nilometer. About 100 years afterwards, when the emperor Adrian viſited Egypt, we are informed from unqueſtionable authority, that 16 cubits were the minimum when the people were able to pay their tribute; and in the fourth century, under the emperor Julian, 15 cubits were the ſtandard; both which accounts correſpond with that of Herodotus. Laſtly, Procopius, who lived in the time of Juſtinian, informs us, that 18 cubits were then requiſite for a minimum.

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No increaſe of land in theſe ages can reaſonably be ſuppoſed;

From theſe accounts, ſo various and diſcordant, it is obvious that no certain concluſion can be drawn. It is not indeed eaſy to determine the reaſon of this difference in point of fact. The only conjecture we can offer is, that as it appears that by proper care a ſmaller quantity of water will anſwer the purpoſe of producing a plentiful crop, ſo it is not unreaſonable to ſuppoſe that at different periods the induſtry of the people has varied ſo much as to occaſion the diſagreement in queſtion. This would undoubtedly depend very much upon their governor; and indeed Strabo informs us that it was by the care of the governor Petronius, that ſuch a ſmall quantity of water was made to anſwer the purpoſe. The concluſion drawn by Mr Bruce from the whole of the accounts above related, is, that from them it is moſt probable that no increaſe of land has been indicated by the nilometer from the time of Moeris to that of Juſtinian.

133
Nor in more modern times.

On the conqueſt of Egypt by the Saracens, their barbarous and ſtupid khalif deſtroyed the nilometer, cauſing another to be built in its ſtead, and afterwards fixed the ſtandard of paying tribute conſiderably below what it had uſually been. The Egyptians were thus kept in continual terror, and conſtantly watched the new nilometer to obſerve the gradual increaſe or decreaſe of the water. On this he ordered the new nilometer to be deſtroyed, and another to be conſtructed, and all acceſs to it to be denied to the people. Which prohibition is ſtill continued to Chriſtians; though our author found means to get over this obſtacle, and has given a figure of the inſtrument itſelf. That the people might not, however, be ſuppoſed to remain in total ignorance of their ſituation, he commanded a proclamation to be daily made concerning the height of the water, but in ſuch an unintelligible manner that nobody was made any wiſer; nor, according to our author, is the proclamation underſtood at this day. From his own obſervations, however, Mr Bruce concludes, that 15 cubits are now the minimum of inundation, and as this coincides with the accounts of it in the times of Herodotus and Adrian, he ſuppoſes with great probability, that the ſame quantity of water has been neceſſary to overflow this country from the earlieſt accounts to the preſent time.

134
M. Savary's opinion concerning the iſle of Pharos refuted by M. Volney.

It now remains only to take notice of what is ſaid by M. Savary concerning the former diſtance of the iſland of Pharos from the land to which it is now joined.... With regard to his other aſſertions concerning the city of Metelis having been once a ſea-port, M. Volney proves that he has quoted Strabo unfairly, and conſequently no ſtreſs is to be laid upon them. The principal, indeed the only, evidence therefore which remains, is the paſſage already quoted from Homer, viz. that "the iſland of Pharos is as far diſtant from one of the mouths of the Nile as a veſſel can ſail in one day before the wind." "But (ſays M. Volney) when Homer ſpeaks of the diſtance of this iſland, he does not mean its diſtance from the ſhore oppoſite, as that traveller (M. Savary) has tranſlated him, but from the land of Egypt and the river Nile. In the ſecond place, by a day's ſail we muſt not underſtand that indefinite ſpace which the veſſels, or rather the boats, of the ancient Greeks, could paſs through in a day; but an accurate and determined meaſure of 540 ſtadia. This meaſure is aſcertained by Herodotus, and is the preciſe diſtance between Pharos and the Nile, allowing, with M. d'Anville, 27,000 toiſes to 540 ſtadia. It is therefore far from being proved, that the increaſe of the Delta or of the continent was ſo rapid as has been repreſented; and, if we were diſpoſed to maintain it, we ſhould ſtill have to explain how this ſhore, which has not gained half a league from the days of Alexander, ſhould have gained eleven in the far ſhorter period from the time of Menelaus to that conqueror. The utmoſt extent of the encroachment of this land upon the ſea, however, may be learned from the words of Herodotus; who informs us, that "the breadth of Egypt, along the ſea-coaſt, from the gulph of Plinthine to the lake Serbonis near mount Caſius, is 3600 ſtadia; and its length from the ſea to Heliopolis 1500 ſtadia." Allowing therefore the ſtadium of Herodotus to be between 50 and 51 French toiſes, the 1500 ſtadia juſt mentioned are equal to 76,000 toiſes; which, at the rate of 57,000 to a degree, gives one degree and near 20 minutes and an half. But from the aſtronomical obſervations of M. Niebuhr, who travelled for the king of Denmark in 1761, the difference of latitude between Heliopolis, now called *Matarea*, and the ſea, being one degree 29 minutes at Damietta, and one degree 24 minutes at Roſetta, there is a difference on one ſide of three minutes and an half, or a league and an half encroachment; and eight minutes and an half, or three leagues and an half on the other."

Thus the diſpute concerning the augmentation of the land of Egypt by the Nile ſeems to be abſolutely decided; and the encroachments of it on the ſea ſo trifling, that we may juſtly doubt whether they exiſt, or whether we are not entirely to attribute the apparent differences to thoſe which certainly take place betwixt the ancient and modern menſuration. M. Volney gives a very particular deſcription of the face of the country; but takes notice of the inconveniences under which travellers labour in this country, by which it is rendered extremely difficult, to ſay any thing certain with regard to the nature of the ſoil or mineral productions. Theſe ariſe from the barbarity and ſuperſtition of the people, who imagine all the Europeans to be magicians and ſorcerers, who come by their magic art to diſcover the treaſures which the genii have concealed under the ruins. So deep rooted is this opinion, that no perſon dares walk alone in the fields, nor can he find any one willing to accompany him; by which means he is confined to the banks of the river, and it is only by comparing the accounts of various travellers that any ſatisfactory knowledge can be acquired.

135 Volney's account of the face of the country.

According to this author, the entrance into Egypt at Roſetta preſents a moſt delightful proſpect, by the perpetual verdure of the palm-trees on each ſide, the orchards watered by the river, with orange, lemon, and other fruit-trees, which grow there in vaſt abundance; and the ſame beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he ſays, that nothing can more reſemble the appearance of the country than the marſhes of the lower Loire, or the plains of Flanders: inſtead, however, of the numerous trees and country-houſes of the latter, we muſt imagine ſome thin woods of palms and ſycamores, with a few villages of mud-walled cottages, built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being ſo gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be ſeen but palm-trees, ſingle or in clumps, which become more rare in proportion as you advance; with wretched villages compoſed of huts with mud-walls, and a boundleſs plain, which at different ſeaſons is an ocean of freſh water, a miry moraſs, verdant field, or a duſty deſert; and on every ſide an extenſive and foggy horizon, where the eye is wearied and diſguſted. At length, towards the junction of the two branches of the river, the mountains of Cairo are diſcovered on the eaſt; and to the ſouth-weſt three detached maſſes appear, which from their triangular form are known to be the pyramids. We now enter a valley which turns to the ſouthward, between two chains of parallel eminences. That to the eaſt, which extends to the Red Sea, merits the name of a mountain from its ſteepneſs and height, as well as that of a deſert from its naked and ſavage appearance. Its name in the Arabic language is *Mokattam*, or the *hewn-mountain*. The weſtern is nothing but a ridge of rock covered with ſand, which has been very properly termed a *natural mound* or *cauſeway*. In ſhort, that the reader may at once form an idea of this country, let him imagine on one ſide a narrow ſea and rocks; on the other, immenſe plains of ſand; and in the middle, a river, flowing through a valley of 150 leagues in length and from three to ſeven wide, which at the diſtance of 30 leagues from the ſea ſeparates into two arms; the branches of which wander over a ſoil almoſt free from obſtacles, and void of declivity.

From comparing his own obſervations with thoſe of other travellers, our author concludes, that the baſis of all Egypt from *Aſouan* (the ancient Syene) to the Mediterranean, is a continued bed of calcareous ſtone of whitiſh hue, and ſomewhat ſoft, containing the ſame kind of ſhells met with in the adjacent ſeas, and which forms the immenſe quarries extending from Saouadi to Manſalout for the ſpace of more than 25 leagues, according to the teſtimony of Father Sicard.

136 Mr Bruce's account of the deſerts, marble, mountains, &c.

Mr Bruce, however, gives us a much more particular account of the ſources from whence were derived the vaſt quantities of marble met with in the remains of ancient buildings in this country. Theſe he diſcovered during his journey from Kenne to Coſſeir on the Red Sea, before he took his expedition to Abyſſinia. He gives a moſt diſmal idea of the deſerts through which he paſſed. What houſes he met with were conſtructed, like thoſe M. Volney mentions, of clay, being no more than ſix feet in diameter, and about ten in height. The mountains were the moſt dreary and barren that can be imagined; and the heat of the ſun ſo great, that two ſticks rubbed together only for half a minute would take fire and flame. In theſe burning regions no living creature was to be met with, even the poiſonous ſerpents and ſcorpions not being able to find ſubſiſtence. The firſt animal he ſaw was a ſpecies of ants in a plain called *Hamra* from the purple colour of its ſand; and it was remarkable that theſe inſects were of the ſame colour with the ſand itſelf. No water was any where to be met with on the ſurface; though at a place called *Legeta* there were ſome draw-wells, the water of which was more bitter than ſoot itſelf. At Hamra the porphyry mountains and quarries begin, the ſtone of which is at firſt ſoft and brittle; but the quantity is immenſe, as a whole day was taken up in paſſing by them. Theſe porphyry mountains begin in the latitude of nearly 24 degrees, and continue along the coaſt of the Red Sea to about 22° 30′, when they are ſucceeded by the marble mountains; theſe again by others of alabaſter, and theſe laſt by baſaltic mountains. From the marble mountains our author ſelected twelve kinds, of different colours, which he brought along with him. Some of the mountains appeared to be compoſed entirely of red and others of green marble, and by their different colours afforded an extraordinary ſpectacle. Not far from the porphyry mountains the cold was ſo great, that his camels died on his return from Abyſſinia, though the thermometer ſtood no lower than 42°.

Near to Coſſeir he diſcovered the quarries whence the ancients obtained thoſe immenſe quantities of marble with which they conſtructed ſo many wonderful works. The firſt place where the marks of their operations were very perceptible, was a mountain much higher than any they had yet paſſed, and where the ſtone was ſo hard that it did not even yield to the blows of a hammer. In this quarry he obſerved that ſome ducts or channels for conveying water terminated; which, according to him, ſhows that water was one of the means by which theſe hard ſtones were cut. In four days, during which our author travelled among theſe mountains, he ſays, that he had "paſſed more granite, porphyry, marble, and jaſper, than would build Rome, Athens, Corinth, Syracuſe, Memphis, Alexandria, and half a dozen ſuch cities." It appeared to him that the paſſages between the mountains and which he calls *defiles*, were not natural but artificial openings; where even whole mountains had been cut out, in order to preſerve a gentle ſlope towards the river. This deſcent our author ſuppoſes not to be above one foot in 50; ſo that the carriages muſt have gone very eaſily, and rather required ſomething to retard their velocity than any force to pull them forward. Concerning the mountains in general, he obſerves, that the porphyry is very beautiful to the eye, and is diſcovered by a fine purple ſand without any gloſs. An unvariegated marble of a green colour is generally met with in the ſame mountain; and where the two meet, the marble becomes ſoft for a few inches, but the porphyry retains its hardneſs. The granite has a dirty brown appearance, being covered with ſand; but on removing this, it appears of a grey colour with black ſpots, with a reddiſh caſt all over it. The granite mountains lie nearer to the Red Sea, and ſeem to have afforded the materials for Pompey's pillar. The redneſs above mentioned ſeems to go off on expoſure to the air; but reappears on working or poliſhing the ſtone farther. The red marble is next to the granite, though not met with in the ſame mountain. There is alſo a red kind with white veins, and vaſt quantities of the common green ſerpentine. Some ſamples of that beautiful marble named *Iſabella* were likewiſe obſerved; one of them of that yellowiſh caſt called *quaker-colour*, the other of the bluiſh kind named *dove-colour*. The moſt valuable kind is that named *verde antico*, which is found next to the Nile in the mountains of ſerpentine. It is covered by a kind of blue fleaky ſtone, ſomewhat lighter than a ſlate, more beautiful than moſt kinds of marble, and when poliſhed having the appearance of a volcanic lava. In theſe quarries the verde antico had been uncovered in patches of about 20 feet ſquare. There were ſmall pieces of African marble ſcattered about in ſeveral places, but no rocks or mountains of it; ſo that our author conjectures it to lie in the heart of ſome other kind. The whole is ſituated on a ridge with a deſcent to the eaſt and weſt; by which means it might eaſily be conveyed either to the Nile or Red Sea, while the hard gravel and level ground would readily allow the heavieſt carriages to be moved with very little force.

137
Of a ſuppoſed emerald mine.

Travellers have talked of an emerald mine in theſe deſerts; but from the reſearches of Mr Bruce, it does not appear to have any exiſtence. In the Red Sea indeed, in the latitude of 25° 3', at a ſmall diſtance from the ſouth-weſtern coaſt, there is an iſland called the *Mountain of Emeralds;* but none of theſe precious ſtones are to be met with there. Here, as well as on the continent, there were found many pieces of a green pellucid ſubſtance; but veined, and much ſofter than rock-cryſtal, though ſomewhat harder than glaſs. A few yards up the mountain he found three pits, which are ſuppoſed to have been the mines whence the ancients obtained the emeralds; but though many pieces of the green ſubſtance above mentioned were met with about theſe pits, no ſigns of the true emerald could be perceived. This ſubſtance, however, he conjectures to have been the *ſmaragdus* of the Romans.

138
Stones of a curious appearance.

In the mountains of Coſſeir, as well as in ſome places of the deſerts of Nubia, our author found ſome rocks exactly reſembling petrified wood.

The only metal ſaid by the ancients to be produced in Egypt is copper. On the road to Suez are found great numbers of thoſe ſtones called *Egyptian flints* and *pebbles*, though the bottom is a hard, calcareous, and ſonorous ſtone. Here alſo M. Volney tells us, that the ſtones above mentioned, and which reſemble petrified wood, are to be met with. Theſe, he ſays, are in the form of ſmall logs cut ſlanting at the ends, and might eaſily be taken for petrifactions, though he is convinced that they are real minerals.

139
Salt lakes.

F. Sicard mentions two lakes, from the water of which is produced annually a great quantity of ſalt containing much mineral alkali; and M. Volney informs us, that the whole ſoil of this country is impregnated with ſalt; ſo that, upon digging to ſome depth in the ground, we always meet with brackiſh water impregnated in ſome degree with the mineral alkali as well as with common ſalt. The two lakes mentioned by Sicard are ſituated in the deſert to the weſt of the Delta; and are three or four leagues in length, and about a quarter of a league in breadth, with a ſolid and ſtony bottom. For nine months in the year they are without water; but in the winter time there oozes out of the earth a reddiſh violet-coloured water, which fills the lakes to the height of five or ſix feet. This being evaporated by the return of the heat, there remains a bed of ſalt two feet thick and very hard which is broken in pieces with iron bars; and no leſs than 30,000 quintals are procured every year from theſe lakes. So great is the propenſity of the Egyptian ſoil to produce ſalt, that even when the gardens are overflowed for the ſake of watering them, the ſurface of the ground, after the evaporation and abſorption of the water, appears glazed over with ſalt. The water found in the wells contains mineral alkali, marine ſalt, and a little nitre.

140
Vegetable mould of Egypt not originally derived from Ethiopia.

M. Volney is of opinion, that the fertile mould of Egypt, which is of a black colour, differs eſſentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the waters of the Nile. This ſeems to contradict what he had before advanced againſt M. Savary concerning the increaſe of the land of Egypt by means of the waters of this river: but there is no reaſon at all to ſuppoſe this kind of earth to be of a foreign origin; it being always the reſult of vegetation and cultivation. Even the moſt barren and ſandy ſpots in the world, if properly watered, and ſuch vegetables planted in them as would grow there, in time would be covered with this black earth as well as others: and of this kind of artificial formation of ſoil travellers give us a remarkable inſtance in the garden of the monks at Mount Sinai, where the country is naturally as barren as in any place of the world. "The monks of Sinai (ſays Dr Shaw), in a long proceſs of time, have covered over with dung and the ſweepings of their convent near four acres of naked rocks; which produce as good cabbage, roots, ſallad, and all kinds of pot-herbs, as any ſoil and climate whatſoever. They have likewiſe raiſed olive, plum, almond, apple, and pear trees, not only in great numbers, but of excellent kinds. The pears particularly are of ſuch eſteem at Cairo, that there is a preſent of them ſent every year to the baſhaw and perſons of the firſt quality. Neither are their grapes inferior in ſize and flavour to any whatſoever: it being fully demonſtrated, by what this little garden produces, how far an indefatigable induſtry can prevail over nature; and that ſeveral places are capable of culture and improvement which were intended by nature to be barren, and which the lazy and ſlothful have always ſuffered to be ſo."

From this general account of the country, we may reaſonably conclude, that the natural fertility of E-

141
Natural fertility of Egypt not diminiſhed.

gypt is not diminiſhed in modern times, provided the ſame pains were taken in the cultivation of it as formerly; but this is not to be expected from the preſent degenerate race of inhabitants. "The Delta (ſays Mr Savary) is at preſent in the moſt favourable ſtate for agriculture. Waſhed on the eaſt and weſt by two rivers formed by the diviſion of the Nile, each of which is as large and more deep than the Loire, interſected by innumerable rivulets; it preſents to the eye an immenſe garden, all the different compartments of which may be eaſily watered. During the three months that the Thebais is under water, the Delta poſſeſſes fields covered with rice, barley, vegetables, and winter fruits. It is alſo the only part of Egypt where the ſame field produces two crops of grain within the year, the one of rice, the other of barley."

142
Method of purifying and cooling the water in Egypt.

The only cauſe of all this fertility is the Nile, without which the whole country would ſoon become an uninhabitable deſert, as rain falls very ſeldom in this part of that world. It flows with a very gentle ſtream through the flat country, and its waters are very muddy, ſo that they muſt have time to ſettle, or even require filtration before they can be drunk. For purifying the water, the Egyptians, according to M. Volney, uſe bitter almonds, with which they rub the veſſel containing it, and then the water becomes light and good; but on what principle this ingredient acts, we cannot pretend to determine. Unglazed earthen veſſels filled with water are kept in every apartment; which by a continual evaporation through their porous ſubſtance, render the contained fluid very cool even in the greateſt heats*. The river continues muddy for ſix months; and during the three which immediately precede the inundation, the ſtream being reduced to an inconſiderable depth, becomes heated, green, fetid, and full of worms. The Egyptians in former times paid divine honours to the Nile, and ſtill hold it in great veneration. They believe its waters to be very nouriſhing, and that they are ſuperior to any in the world; an opinion very excuſable in them, as they have no other, and large draughts of cold water are among their higheſt luxuries.

* See *Evaporation*.

143
Of the inundation of the Nile.

This river, ſwelled by the rains which fall in Abyſſinia, begins to riſe in Egypt about the month of May; but the increaſe is inconſiderable till towards the end of June, when it is proclaimed by a public crier thro' the ſtreets of Cairo. About this time it has uſually riſen five or ſix cubits; and when it has riſen to 16, great rejoicings are made, and the people cry out *Waſfah Allah*, that is, that God has given them abundance. This commonly takes place about the latter end of July, or at fartheſt before the 20th of Auguſt; and the ſooner it takes place, ſo much the greater are the hopes of a good crop. Sometimes, though rarely, the neceſſary increaſe does not take place till later. In the year 1705, it did not ſwell to 16 cubits till the 19th of September; the conſequence of which was, that the country was depopulated by famine and peſtilence.

We may eaſily imagine that the Nile cannot overflow the whole country of itſelf in ſuch a manner as to render it fertile; for which reaſon there are innumerable canals cut from it acroſs the country, as has already been obſerved, by which the water is conveyed to diſtant places, and almoſt every town or village has one of theſe canals. In thoſe parts of the country where the inundation does not reach, and where more water is required than it can furniſh, as for watering of gardens, they muſt have recourſe to artificial means for raiſing it from the river. In former times they made uſe of Archimedes's ſcrew*; but that is now diſuſed, and in place of it they have choſen the Perſian wheel. This is a large wheel turned by oxen, having a rope hung with ſeveral buckets which fill as it goes round, and empty themſelves into a ciſtern at the top. Where the banks of the river are high, they frequently make a baſon in the ſide of them, near which they fix an upright pole, and another with an axle acroſs the top of that, at one end of which they hang a great ſtone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raiſed by the deſcent of the ſtone, and emptied into a ciſtern placed at a proper height. This kind of machine is uſed chiefly in the upper parts of the country, where the raiſing of water is more difficult than in places near the ſea. When any of their gardens or plantations want water, it is conveyed from the ciſterns into little trenches, and from thence conducted all round the beds in various rills, which the gardener eaſily ſtops by raiſing the mould againſt them with his foot, and diverts the current another way as he ſees occaſion.

* See *Hydroſtatics*.

144
Nilometer deſcribed.

The riſe of the inundation is meaſured, as has already been obſerved, by an inſtrument adapted for the purpoſe, and called *mikeas*, which we tranſlate *nilometer*. Mr Bruce informs us, that this is placed between Geeza and Cairo, on the point of an iſland named *Rhoda*, about the middle of the river, but ſomewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a ciſtern neatly lined with marble. The bottom of this ciſtern reaches to that of the river, and there is a large opening by which the water has free acceſs to the inſide. The riſe of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 peeks or cubits of 22 inches each. The two lower moſt of theſe have no ſubdiviſions; but each of the reſt is divided into 24 parts call *digits*; the whole height of the pillar being 36 feet 8 inches.

145
Of the canals by which the water is conveyed, &c.

When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place; but notwithſtanding this, the Nile is ſo eaſily managed, that many fields lower than the ſurface of its waters are preſerved from injury merely by a dam of moiſtened earth not more than eight or ten inches in thickneſs. This method is made uſe of particularly in the Delta when it is threatened with a flood.

As the Nile does not always riſe to an height ſufficient for the purpoſes of agriculture, the former ſovereigns of Egypt were at vaſt pains to cut proper canals in order to ſupply the deficiency. Some of theſe are ſtill preſerved; but great numbers are rendered uſeleſs through the indolence or barbarity of their ſucceſſors. Thoſe which convey the water to Cairo, into the province of Fayoom, and to Alexandria, are beſt taken care of by government. The laſt is watched by an officer appointed for that purpoſe, whoſe office it is to hinder the Arabs of Bachria, who receive this ſuperfluous water, from turning it off before Alexandria be provided for, or opening it before the proper time, which would hinder the increaſe of the river. In like manner, that which conveys the water to Fayoom is watched, and cannot be opened before that of Cairo, which is called the *Canal of Trajan*. A number of other canals, only taken care of by thoſe who derive advantage from them, proceed from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia; which, making part of the iſthmus of Suez, is the moſt conſiderable of Egypt, and the moſt capable of a great increaſe of cultivation. The plains of Gaza which lie beyond, and are poſſeſſed by the Arabs, would be no leſs fertile, were it not for the exceſſive inclination theſe people have to deſtroy, ſo that they make war even with the ſpontaneous productions of the earth. A number of other canals run through the Delta; and the veſtiges of thoſe which watered the provinces to the eaſtward and weſtward, ſhow that in former times theſe were the beſt cultivated parts of Egypt. "We may alſo preſume (ſays the Baron de Tott), from the extent of the ruins of Alexandria, the conſtruction of the canal, and the natural level of the lands which encompaſs the lake Mareotis, and extend themſelves weſtward to the kingdom of Barca, that this country, at preſent given up to the Arabs, and almoſt deſert, was once ſufficiently rich in productions of every kind to furniſh the city of Alexandria with its whole ſubſiſtance."

146 Air and climate of Egypt.

The air and climate of Egypt are extremely hot, not only from the height of the ſun, which in ſummer approaches to the zenith, but from the wantof rain and from the vicinity of thoſe burning and ſandy deſerts which lie to the ſouthward. In the months of July and Auguſt, according to M. Volney, Reamur's thermometer ſtands, even in the moſt temperate apartments, at the height of 24 or 25 degrees above the freezing point; and in the ſouthern parts it is ſaid to riſe ſtill higher. Hence, he ſays, only two ſeaſons ſhould be diſtinguiſhed in Egpyt, the cool and the hot, or ſpring and ſummer. The latter continues for the greateſt part of the year, viz. from March to November or even longer; for by the end of February the ſun is intolerable to an European at nine o'clock in the morning. During the whole of this ſeaſon, the air ſeems to be inflamed, the ſky ſparkles, and every one ſweats profuſely, even without the leaſt exerciſe, and when covered with the lighteſt dreſs. This heat is tempered by the inundation of the Nile, the fall of the night-dews, and the ſubſequent evaporation; ſo that ſome of the European merchants, as well as the natives, complain of the cold in winter. The dew we ſpeak of does not fall regularly throughout the ſummer, as with us; the parched ſtate of the country not affording a ſufficient quantity of vapour for this purpoſe. It is firſt obſerved about St John's day (June 24th), when the river has begun to ſwell, and conſequently a great quantity of water is raiſed from it by the heat of the ſun, which being ſoon condenſed by the cold of the night air, falls down in copious dews.

It might naturally be imagined, that as for three months in the year Egypt is in a wet and marſhy ſituation, the exceſſive evaporation and putrefaction of the ſtagnating waters would render it very unhealthy. But this is by no means the caſe. The great dryneſs of the air makes it abſorb vapours of all kinds with the utmoſt avidity; and theſe riſing to a great height, are carried off by the winds either to the ſouthward or northward, without having time to communicate any of their pernicious effects. This dryneſs is ſo remarkable in the internal parts of the country, that fleſh meat expoſed to the open air does not putrefy even in ſummer, but ſoon becomes hard and dry like wood. In the deſerts there are frequently dead carcaſes thus dried in ſuch a manner, and become ſo light, that one may eaſily lift that of a camel with one hand. In the maritime parts, however, this dryneſs of the air is not to be expected. They diſcover the ſame degree of moiſture which uſually attends ſuch ſituations. At Roſetta and Alexandria, iron cannot be expoſed to the air for 24 hours without ruſting. According to M. Volney, the air of Egypt is alſo ſtrongly impregnated with ſalts; for which opinion he gives the following reaſon. "The ſtones are corroded by natrum (mineral alkali), and in moiſt places long cryſtallizations of it are to be found, which might be taken for ſalt-petre. The wall of the Jeſuits garden at Cairo, built with earth and bricks, is every where covered with a cruſt of this natrum as thick as a crown-piece: and when this garden has been overflowed by the waters of the kalidj (canal), the ground, after they have drained off, appears ſparkling on every ſide with cryſtals, which certainly were not brought thither by the water, as it ſhows no ſign of ſalt either to the taſte or by diſtillation."—But whatever may be the quantity of ſalt contained in the earth, it is certain that M. Volney's opinion of its coming thither from the air cannot be juſt. The ſalt in queſtion is exceſſively fixed, and cannot be diſſipated into the air without the violent heat of a glaſs-houſe furnace; and even after this has been done, it will not remain diffuſed through the atmoſphere, but quickly falls back again. No experiments have ever ſhown that any ſalt was or could be diffuſed in the air, except volatile alkali, and this is now known to be formed by the union of two permanently elaſtic fluids; and it is certain that a ſaline air would quickly prove fatal to the animals who breathed it. The abundance of this kind of ſalt in Egypt therefore only ſhows, that by ſome unknown operation the heat of the ſun forms it from the two ingredients of earth and water, though we do not yet underſtand the manner, nor are able to imitate this natural operation.

147 Why exotic plants will not thrive in Egypt.

To this ſaline property of the earth M. Volney aſcribes the exceſſive quickneſs of vegetation in Egypt, which is ſo great, that a ſpecies of gourd called *kara* will, in 24 hours, ſend forth ſhoots of four inches in length; but for the ſame reaſon, in all probability, it is that no exotic plant will thrive in Egypt. The merchants are obliged annually to ſend to Malta for their garden ſeeds; for though the plants thrive very well at firſt, yet if the ſeed of them is preſerved, and ſown a ſecond year, they always come up too tall and ſlender.

By reaſon of the great dryneſs of the air, Egypt is exempted from the phenomena of rain, hail, ſnow, thunder and lightning. Earthquakes are alſo ſeldom heard of in this country; though ſometimes they have been very fatal and deſtructive, particularly one in the year 1112. In the Delta, it never rains in ſummer,

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